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Muscle dysmorphia in Hungarian high risk populations

PhD thesis

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List of abbreviations

AN	anorexia nervosa
BN	bulimia nervosa
MD	muscle dysmorphia
BMI	body mass index
FFMI	fat free mass index
AAS	anabolic-androgenic steroid
MASS	Muscle Appearance Satisfaction Scale
EDI	Eating Disorders Inventory

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1. INTRODUCTION

"The drive for thinness appears to have started in Western cultures and expanded to the less developed areas of the world, where rates of eating disorders are rising. Will the drive for muscularity for men now prominent in the West be exported in a similar way? (...) Currently, few research studies are available, some of which contradict the hypothesis that muscularity is valued only in the West and not in the less developed parts of the world."

(Gray & Ginsberg, 2007)

1.1 Preamble

Eating and body image disorders have typically been considered as the disorders of women, although recent evidence suggests the emergence of these disorders among men as well. The results of the studies conducted over the last two decades indicate that more men report being dissatisfied with their muscularity than before (Grieve, Wann, Henson, & Ford, 2006; Mishkind, Rodin, Silberstein, & Siegel-Moore, 1986; Pope, Phillips, & Olivardia, 2000; Vartanian, Giant, & Passino, 2001). While 25% of men reported muscle dissatisfaction in 1972, this number increased to 32% and 45% in 1985 and 1996 respectively (Berscheid, Walster, & Bohrmstedt, 1973; Cash, Winstead, & Janda, 1986; Garner, 1997). Several studies have documented muscle dissatisfaction and a desire for a more muscular ideal body among men (Fredrick, Fessler & Hazelton, 2005; Lynch & Zellner, 1999; McCreary & Sasse, 2000; Olivardia, Pope, Borowiecki, & Cohane, 2004).

According to a theory, women have reached parity with men in many domains of life in the last few decades, and this led to a crisis in masculinity (Pope, Phillips, & Olivardia, 2000). Therefore, muscularity is one of the few characteristics left for men to emphasize their masculinity. In line with this, in cultures where the traditional male roles (e.g., as breadwinners, protectors) have not declined over the years, the pursuit of the muscular ideal has not been found as prevalent (Yang, Gray, & Pope, 2005; overview: Gray &

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Ginsberg, 2007). From an evolutionary perspective, the biological and evolutionary factors are believed to define the drive for muscularity in males (i.e., muscular appearance –broad chest, smaller waist) is more attractive to women (Jackson, 2002; overview: Gray & Ginsberg, 2007).

Besides the evolutionary factors, culture also designates the appealing body. As the gender difference in relating to body appearance decreases, more and more males experience almost the same sociocultural pressure relating to their appearance as the females do (Miller & Halberstadt, 2005; Hungarian review: Túry, Lukács, Babusa, & Pászthy, 2008). While women experience pressure towards thinness, men often report pressure to obtain and maintain muscularity (Pope, et al., 2001). In the past few years, the number of magazines on male body appearance has been expanding and men now spend considerable amount of money and time on toiletries (Blond, 2008). The increasing body dissatisfaction among males is one of the consequences of these changing societal demands (Jones, Bain, & King, 2008). Males' body dissatisfaction is often associated with excessive exercise and the use of anabolic-androgenic steroids (Smolak & Stein, 2006).

Body dissatisfaction accompanied by body image distortion can lead to the development of muscle dysmorphia (MD; Grieve, 2007; Pope, Katz, & Hudson, 1993). MD is characterized by a pathological preoccupation with muscle size and muscularity. Men with MD have a pathological belief that they are weak and small, while in reality they look unusually muscular (Olivardia, 2001). This special male body image disorder often causes impairment in social and occupational functioning, distress and adoption of unhealthy behaviours, such as bodybuilding dependence, rigid adherence to dietary regimens, or anabolic-androgenic steroid abuse/dependence (Hale, Roth, DeLong, & Briggs, 2010; Kanayama, Barry, Hudson, & Pope, 2006; Pope & Katz, 1994).

The preoccupation with the appearance of the body may be as intense and prevalent in males as in females. The bodybuilding or „muscle-building" is a consequence of this intense obsession, and an increasing industry (e.g., fitness rooms, conditioning sports, anabolic steroids, nutritional supplements, cosmetic surgery, etc.) supports this

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preoccupation. This is very similar –although with an opposite tendency– to the body image disorders of the female population, resulting in the development of traditional eating disorders (anorexia and bulimia nervosa). These disorders are supported by the slimness ideal, and the fitness and beauty industry.

The phenomenon of this male body obsession causes a challenge to the psychiatry, because most of the cases are underrecognized. According to Pope et al. (2000), "the male body dissatisfaction is a silent epidemic". In conclusion, the new forms of body image disorders and modern obsessions/addictions need extended research to understand their pathogenesis and ultimately to develop effective therapeutical approaches.

The overwhelming majority of eating disorder literature comes from Western countries, giving the impression that eating disorders are culture bound problems of these regions. In the last two decades an increasing interest in eating disorders can be observed in Central and Eastern Europe as well. This is due to the relatively high prevalence and incidence rates of anorexia nervosa (AN) and bulimia nervosa (BN) in some countries of this region (Túry, Babusa, Dukay-Szabó, & Varga, 2010; Túry, Babusa, & Varga, 2010).

The vast majority of studies on MD and muscle dissatisfaction among males have also been conducted in Western countries –mostly in the United States. Only little is known about this muscle appearance related body image disorder in the Central-Eastern European region, including Hungary and only few studies examined the body image related disorders, such as MD, among men in other countries than the U.S. The present study fills a niche, since it aimed to examine MD, related psychological correlates, and anabolic-androgenic steroid use in Hungarian male weightlifters. Additionally, exploring cultural differences in the manifestation of male body image disorders (i.e., prevalence rates, morbidity) may improve our understanding of these disorders as the desire for muscularity may vary from culture to culture.

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1.2 Historical review of muscle dysmorphia

The scientific literature on body image disturbances in men is limited in comparison to the literature concerning women. Since eating disorders occur in approximately 0.5–3% of women, and only one tenth of that for men, most studies of eating and body image disorders have focused on women. Furthermore, until recently there were no valid and reliable measures of body image disturbances for men. Research suggests an increasing number of men, who are concerned with their body shapes, especially with their muscularity (Cohane & Pope, 2001; Edwards & Launder, 2000; Leit, Gray, & Pope, 2002; Mayville, Williamson, White, Netemeyer, & Drab, 2002). Recent studies have proposed that men may suffer from a "reverse AN" more commonly referred to as muscle dysmorphia (MD; Pope et al., 1993; Pope, Gruber, Choi, Olivardia, & Phillips, 1997; Pope et al., 2000; review: Túry, Babusa, & Dukay-Szabó, 2011). Reverse AN, or MD is sometimes addressed as bigorexia nervosa (Pope & Hudson 1996), or machismo nervosa (Connan, 1998).

The very first description of MD –a pathological preoccupation with muscularity, also called as reverse AN– was published in 1993 (Pope et al.). The study examined 108 male bodybuilders, of whom 55 were anabolic-androgenic steroid users. According to the interviews, nine men (8.3%) had MD, and three of them had history of AN. Five men with MD reported symptoms of mania or hypomania as the consequences of anabolic-androgenic steroid use. It should be noted that both AN and body dysmorphic disorder are often accompanied by mood disturbances, generally by depression. The study also revealed that four men have started using anabolic-androgenic steroids due to their body image disorders, while another four have developed MD symptoms due to their anabolic-androgenic steroid use.

Prior to this study, Pope and Katz (1988) have studied 41 anabolic-androgenic steroid user male bodybuilders and football players. Nine of the sportsmen had a full affective syndrome and five subjects developed psychotic symptoms in association with their anabolic-androgenic steroid use. These results were replicated in a study with 156 athletes (88 [56.4%] were anabolic-androgenic steroid user and 68 [43.6%] were non-user) which focused on the psychiatric and physical complications of anabolic-

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androgenic steroid use (Pope & Katz, 1994). According to the results, 16 men (10%) displayed the symptoms of MD and all of them were anabolic-androgenic steroid user. Thirty-six men of the anabolic-androgenic steroid users had affective syndrome, five had psychotic symptoms, and six had anxiety symptoms in association with their steroid use.

Steiger (1989) emphasized the endocrinological aspects of MD. According to this theory, male hormones have a protective factor against the development of AN. On the other hand, the abuse of these hormones may lead to the development of reverse AN.

1.3 The history of muscle dysmorphia in Hungary

The first description of MD in Hungary appeared in 1997 (Túry & Gyenis) in a case-report of a 21-year-old male patient who met the criteria of reverse AN and social phobia. He thought to be small with a body height of 205 cm and a body weight of 130 kg, therefore usually avoided social contacts. He engaged in bodybuilding on a regular basis and used anabolic-androgenic steroids. With the first Hungarian description of this new syndrome the authors called the attention to this probably underrecognized disorder.

The first epidemiological study in Hungary was performed among 140 male bodybuilders (Túry, Kovács, & Gyenis, 2001). According to the results, 13 subjects (9.3%) used anabolic-androgenic steroids. Six men (4.3%, all of them were steroid users) fulfilled the criteria of MD described by Pope et al. (1997). The authors concluded that this new syndrome is a frequent and often underrecognized disorder in the bodybuilder population and suggested several sociocultural factors which may play an important role in the development of MD.

The next study about MD in Hungary consisted of the collection of three case reports of MD sufferers. These case reports illustrated the underlying psychological characteristics, namely body image disorder, perfectionism, social isolation, strong attachment to the mother, and distorted intimate relationships (Kovács & Túry, 2001). According to the authors' suggestion, this new syndrome could become more widespread in the next years.

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Recently, there is an increased expectation towards men's body and appearance in Hungary as well (Túry & Babusa, 2012). The male body appearance market, the beauty and fitness industry have been increasing in Hungary as well –for instance, there are more than 200 fitness clubs in the capital city Budapest. There is also a growing trend for male cosmetics and grooming products. The value of groomed, muscular and lean male body has also risen. These recently experienced phenomena may indicate that the male body ideals are similar to those in the Western cultures.

The appearance of MD in Hungary may be the same like that of AN and BN. A few decades ago eating disorders were regarded as the consequences of the Western cultural ideals ("3 W-s": white Western women). Nowadays eating disorders are as widespread in Central-East European region as in the Western countries (Rathner et al., 1995). However, there are some cultural differences in the morbidity of eating disorders between East and West Europe. Surprisingly, Rathner et al. (1995) found the highest prevalence of bulimic behaviours in Hungary compared to Austria and Germany. Unfortunately, representative epidemiological studies on MD are still lacking in Central-East Europe. MD and the muscular ideology might be widespread, but still understudied phenomena in the Central-Eastern European cultures.

1.4 Definition and symptoms of muscle dysmorphia

MD is a psychiatric condition, characterized by a pathological preoccupation with the overall muscularity and drive to gain weight without gaining fat. This kind of body image disorder was long considered as the reverse form of AN since those men with MD believe that they are weak and small but in reality they are unusually muscular (Pope et al., 1993). Contrary to AN where the body image disorder is in connection with the thin ideal, in the case of MD, the body image disorder relates to the athletic ("Schwarzenegger") ideal. The abuse and/or dependence of anabolic androgenic steroids, the hiding behaviour, and the excessive exercise are very common among MD sufferers. Table 1 describes the similar dimensions and the major differences in the symptomatology of AN and MD (Túry & Gyenis, 1997). MD is considered as a special male body image disorder since it is mostly associated with the male bodybuilder population.

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Table 1

Similarities and differences between anorexia nervosa and muscle dysmorphia (cited from Túry & Gyenis, 1997)

Anorexia nervosa	Muscle dysmorphia
➢ typical disorder of women	➢ typical disorder of men
➢ chronic weight loss, emaciation	➢ significant weight gain, hypermuscular physique
➢ intense fear of gaining weight	➢ intense fear of losing weight
➢ body image disorder relating to thin ideal (believe that they are obese)	➢ body image disorder relating to the athletic ideal (believe that they are thin)
➢ demonstrative behaviour	➢ hiding behaviour
➢ abuse of laxatives and diet pills	➢ abuse of anabolic-androgenic steroids

Thompson, Heinberg, Altabe, & Tantleff-Dunn (1999) conceptualized the symptoms of MD through the dimensions of body image disturbances:

a) Perceptual dimension

Individuals with MD tend to perceive themselves as thin and small while in reality they are extremely muscular. Relating to the perceptual distortion, one study showed that 42% of the men with MD could well recognize the inaccuracy in their perception of their own body sizes in contrast to those who could recognize poorly (50%) or could not recognize at all (8%) (Olivardia, Pope, & Hudson, 2000).

b) Cognitive dimension

MD is characterized by a preoccupation and obsession with the idea that one's body is insufficiently big and muscular even though their well-defined physique (Pope et al., 2000). The body image distortion can lead to obsessive thoughts and intense anxiety about their appearance. Olivardia et al. (2000) found that men with MD reported thinking about their lack of muscularity for more than 5 hours per day. Since these thoughts are very intrusive and time consuming it can be even difficult to concentrate on a task for these men (Pope et al., 2000).

Specific cognitive distortions –like those in body dysmorphic disorder– are very common, such as "black and white thinking", "filtering", and "mind reading" (Pope et al., 2000). Individuals with MD have little control over these thoughts, which can cause

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the feeling of helplessness. They often try to overcome these feelings and thoughts via compulsive behaviours, such as excessive bodybuilding.

c) Behavioural dimension

The most common behaviour associated with MD is excessive working out. Men with MD spend long hours with lifting weights in the gym and often give up important social, occupational, or recreational activities because of the compulsive need to maintain their workout and diet schedule (Pope et al., 1997). This compulsive workout is distinct from enthusiastic sport activities and should not be confused with them. MD sufferers have a compulsive need for working out which leads to a rigid workout schedule that they even sacrifice important events to adhere to their strict workout regimen. Moreover, men with MD have a special diet that they strictly try to follow. The dietary schedule focuses on the "perfect" combination of proteins, carbohydrates, fats, and vitamins in order to develop and build their bodies (Olivardia, 2001).

Mirror checking is another prominent behavioural aspect of MD. Extreme mirror checking derives from the obsessive thought of being or getting too small which leads to an intense urge to check. Men with MD reports significantly more mirror checking (9.2 ± 7.5) per day than normal comparison bodybuilders did (3.4 ± 3.3 [Olivardia et al., 2000]).

Social avoidance or hiding behaviour is a common feature of individuals with MD as they feel very uncomfortable and anxious about their body and appearance (Pope et al., 1997). Therefore, they often cancel or avoid social events where their bodies would be exposed to others, wear bulky clothes even in hot weather because they feel ashamed of their "weak" bodies. This kind of negative body image can lead to impaired social and intimate relationships.

Men with MD commonly use anabolic-androgenic steroids to enhance their muscle mass. According to a study, 46% of men with MD reported steroid use, while only 7% of the comparison weightlifters without MD (Olivardia et al., 2000). Men continue to

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use these substances despite being aware of or experiencing the adverse physical or psychological consequences (Pope et al., 1997).

As the consequence of overtraining and excessive exercise, men with MD are at risk for several injuries, for instance, broken bones, damaged joints and ligaments (Pope et al., 1997). Because of the compulsive need for lifting weights and the intense fear of losing weight they often keep on training even when they are seriously injured.

d) Emotional dimension

The feelings of guilt when skipping a workout or neglecting the special diet are pervasive for those with MD who are so insisting on their workout and diet schedule. They often feel depressed and anxious about their appearance and may experience intense cognitive distortions when they have to skip a workout.

1.5 Diagnostic criteria for muscle dysmorphia

The Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, Text Revised (DSM-IV-TR; American Psychiatric Association, 2000) provides standard criteria for the classification of mental disorders. MD was conceptualized as a subtype of body dysmorphic disorder; therefore, Pope et al. (1997) described the operational diagnostic criteria for MD on the basis of the above mentioned psychiatric disorder. The diagnostic criteria for MD is not officially listed in the DSM-IV-TR currently; although, the proposed diagnostic criteria could allow and facilitate further research and clinical work in this field.

The proposed diagnostic criteria for MD (cited from Pope et al., 1997) are as follows (all of the listed criteria must be met for a diagnosis of MD):

1. The person has a preoccupation with the idea that his or her body is not sufficiently lean and muscular.

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2. The preoccupation causes clinically significant distress or impairment in social, occupational, or other important areas of functioning as demonstrated by at least two of the following four criteria:

a. The individual frequently gives up important social, occupational, or recreational activities because of a compulsive need to maintain his or her workout and diet schedule.

b. The individual avoids situations in which his or her body is exposed to others, or endures such situations only with marked distress or intense anxiety.

c. The preoccupation about the inadequacy of body size or musculature causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.

d. The individual continues to work out, diet, or use performance-enhancing substances despite the knowledge of adverse physical or psychological consequences.

3. The primary focus of the preoccupation and behaviours is on being too small or inadequately muscular, and not on being fat, as in AN, or on other aspects of the appearance, as in other forms of body dysmorphic disorder.

1.6 Epidemiology of muscle dysmorphia

The current prevalence rate of MD in the general population is unknown. Since MD is considered as a relatively new psychiatric disorder, only limited epidemiological studies are available in this field (Babusa & Túry, 2010).

Most of the studies that have been conducted on MD suggest that it occurs more frequently in men as they experience more societal pressure to attain and maintain muscular physique (Pope et al., 1997; Olivardia, 2001). Bodybuilders or weightlifters are considered as the high risk population for the development of MD (Pope et al., 1993; Wolke & Sapouna, 2008). Participating in sports that requires high muscle mass, such as weightlifting or bodybuilding, apparently increases the risk for developing MD (Grieve, 2007). However, it should be noted that sport participation with a pressure toward huge muscles, lean body mass, and a desire for attaining a certain weight gain

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does not directly lead to the development of MD, but it may increase the risk for developing the disorder.

As for the prevalence rate, during the very first description of MD, 8.3% (n = 9) male bodybuilders out of 108 met the criteria for "reverse AN" (Pope et al., 1993). Pope and Katz (1994) examined 156 male bodybuilders and reported that 10% (n = 16) of them had MD. Another study investigated MD among 193 male and female body dysmorphic disordered patients and found a 9.3% (n = 18) prevalence rate for MD and all MD cases were male (Pope et al., 1997).

Nevertheless, a study conducted among college students found that the subclinical forms of MD symptomatology also appear in the general population, and that both men and women could be affected (Goodale, Watkins, & Cardinal, 2001). Pope et al. (2000) estimated that approximately 100,000 people worldwide meet the proposed diagnostic criteria of MD in the general population. Olivardia (2001) noted that the prevalence of MD is underestimated and suggested that hundreds of thousands of men might have subclinical forms of MD or experience some aspects of the disorder. Given that approximately 5 million men have a membership in gym in the United States and at least 5% of weightlifters have MD, half a million men might suffer from the disorder. Moreover, about 1 million men have body dysmorphic disorder in the United States and 9% of them have MD, meaning that 90,000 body dysmorphic men might have MD. These tentative estimations should be treated carefully and they remain only speculations as epidemiological studies are still missing.

Studies proposed that the age of onset of MD is in late adolescence or in the early adulthood. Olivardia et al. (2000) found that the mean age of onset for MD was 19.4 ± 3.6 years. Similarly, Cafri, Olivardia, and Thompson (2008) reported the mean age of onset 19.17 ± 4.38 years.

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1.7 Comorbid conditions

1.7.1 Eating disorders

One of the behavioural characteristics of MD is the rigid adherence to the dietary schedule. Sometimes the excessive diet can lead to the development of a full-blown eating disorder, such as BN.

Many studies pointed out that men with MD have a rigid adherence to their diet plan, which is typically high in protein and low in fat. In order to gain more muscle mass they count calories, calculate the proportion of the nutritional ingredients (i.e., protein, fat, carbohydrate) and eat in every few hours even if they are not hungry (Mossley, 2009). Any deviation from the special diet plan results in intense anxiety and the feeling of guilt (Pope et al., 1997). Neglecting the rules of the specific diet is usually followed by the urge for compensation, such as more intense or extra exercise. This feature of MD is also common in AN.

In a study by Olivardia et al. (2000) 29% (n = 7) of men with MD reported a history of AN, BN, or binge-eating disorder. Moreover, muscle dysmorphic men had almost the same scores on the Eating Disorder Inventory (Garner, Olmstead, & Polivy, 1983) like that of eating disordered patients, that is they showed perfectionistic traits, maturity fears, feelings of ineffectiveness, and drive for thinness.

The first description of MD revealed its association with AN, since two out of the nine men with MD reported previous history of AN (Pope et al., 1993). In another study, two out of 16 muscle dsymorphic athletes had a history of AN (Pope & Katz, 1994). Following this, Pope et al. (1997) found quite the same results during the interview of 15 MD sufferers, two of whom reported past history of BN, while no one did in the comparison non-MD weightlifter group.

A recent study that revealed the associated features of MD found that disordered eating, dieting, vomiting, and the use of diet pills as weight control behaviours are associated with the symptoms of MD (McFarland & Kaminski, 2009).

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Mangweth et al. (2001) compared body image and eating behaviours of male bodybuilders and eating disordered patients. According to the study, bodybuilders showed similar psychopathological body and eating attitudes like that of eating disordered males. Although, bodybuilders are rather concerned with gaining muscle than losing fat, they also have an increased preoccupation with their body image, food and exercise (Mangweth et al., 2001). The severe dieting practices that are prevalent in the bodybuilding sport, indicates that bodybuilders are at increased risk for developing an eating disorder and abnormal body image modifying behaviours (Anderson, Barlett, Morgan, & Brownell, 1995).

A large amount of bodybuilding books and magazines are available and provide specific diet plans to achieve more muscular body. They regularly suggest certain nutritional plans for bodybuilders (e.g., what to eat, when to eat, and why to eat) for instance the consumption of great amount of protein (40-60 grams of protein and 40-80 grams of carbohydrates) 5–6 times a day. A very famous diet of bodybuilders is the so called anabolic/catabolic diet, which is based on the two phases of the metabolism (anabolic and catabolic) that they have to alternate in order to gain muscle and reduce body fat. The diet starts with the anabolic phase (weight gain), which requires the increase of caloric intake that aims the growth of muscle mass. The use of high calorie food intake inevitably results in the growth of body fat as well. The second, catabolic phase (weight loss) is aimed to reduce body fat and retain the lean muscle mass by reducing calorie intake (Weider & Reynolds, 1983). These kinds of special diets and the alternation between weight gain and weight loss strategies often increase the risk for the development of AN or BN (Goldfield, Harper, & Blouin, 1998).

1.7.2 Exercise dependence

The physical benefits of regular exercise are well-known, including reduced risk for cardiovascular disease, certain cancers, and diabetes (U.S. Department of Health and Human Services, 1996). Regular and moderate level physical activity plays an important role not only in the physical but also in the mental well-being, as it increases general well-being, creates positive mood, and reduces the level of depression and anxiety (Reed & Ones, 2006).

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Although, regular physical activity is considered to be healthy, some forms of exercise may have negative consequences. Growing body of literature reports that exercise can lead to a form of dependence or addiction in case of some individuals (Davis & Fox, 1993; de Coverley Veale, 1987; Hausenblas & Fallon, 2002; Krejci et al, 1992).

1.7.2.1 Definition and criteria of exercise dependence

Exercise dependence is defined as "a craving for leisure-time physical activity, resulting in uncontrollable excessive exercise behaviour that manifests in physiological (e.g. tolerance/withdrawal) and/or psychological (e.g. anxiety, depression) symptoms" (Hausenblas & Symons Downs, 2002). Others define exercise addiction as an unhealthy reliance or compulsive need for the workout, not necessarily to improve performance in competition, but to deal with daily stress and provide relief from bad feelings associated with not working out (Baratt, 1994).

Most of the studies examined the exercise dependence in runners (Hailey & Bailey, 1982; Furst & Germone, 1993), bodybuilders (Smith & Hale, 2005), aerobic participants (Kirkby & Adams, 1996), and triathletes (Blaydon & Lindner, 2002).

Terry, Szabo, and Griffiths (2004) proposed the criteria for exercise dependence (Hungarian review: Demetrovics & Kurimay, 2008):

1. *Salience* – The exercise becomes the most important activity in the person's life and dominates their thinking, feelings, and behaviour.
2. *Mood modification* – The individual experiences mood modification as a consequence of excessive exercise which can be considered as a coping strategy (i.e., experiencing an arousal enhancing ''high'' effect, or tranquilizing feeling of ''escape'' or ''numbing'').
3. *Tolerance* – Increasing amounts of the exercise are required to achieve the former effects (e.g. euphoria).
4. *Withdrawal symptoms* – Unpleasant feelings and/or physical effects occur when the exercise is discontinued or suddenly reduced (e.g. sleeping disturbances, moodiness, and irritability).

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5. *Conflict* – The individual still continues the excessive exercise even though he/she realizes the interpersonal conflicts between the addict and the environment, conflicts with other activities (e.g., job, social life, and hobbies).
6. *Relapse* – Rapid reinstatement of the previous pattern of exercise and withdrawal symptoms after a period of abstinence or control.
7. The preoccupation with the exercise is *not better accounted for by another mental disorder*. For instance in case of AN the excessive exercise is the consequence of the eating disorder and serves as a weight control strategy. Thus it has to be considered as the symptom of AN and defined as "secondary exercise dependence" (de Coverley Veale, 1987). Exercise dependence can develop without any accompanying eating disorder, which is identified as "primary exercise dependence" (de Coverley Veale, 1987).

1.7.2.3 Bodybuilding dependence and muscle dysmorphia

After the first description of exercise dependence, it has been studied in several kinds of sports. However, bodybuilding seemed to be a neglected area of interest until the last few years, when studies pointed out the relationship between exercise dependence, bodybuilding, and MD. Compulsive bodybuilding is considered as a behavioural characteristic of MD as MD sufferers spend long hours with lifting weight in order to gain muscle mass and achieve muscular physique. They often sacrifice important social and occupational activities in order to keep the strict exercise schedule. This kind of exercise addiction is called bodybuilding dependence (Smith, Hale, & Collins, 1998; Smith & Hale, 2004). Given this, most of the instruments that measure MD symptoms, also assess bodybuilding dependence.

Relating to the causal factors of bodybuilding dependence, research revealed that often low self-esteem and body image dissatisfaction serve as the basis for bodybuilding dependence (Smith et al., 1998; Hurst, Hale, Smith, & Collins, 2000). Smith et al. (1998) highlighted that some individuals may have started bodybuilding training because they suffered from low self-esteem and poor body image, and they may have become dependent on it to feel good about themselves. Bodybuilding training improves self concept and body attitudes, and those who are involved in this sport may experience

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self-efficacy, thus they can become dependent upon it to feel positive about themselves (Tucker, 1987).

Hurst et al. (2000) examined exercise dependence in experienced and inexperienced bodybuilders and weightlifters. They found that social support and positive comments of others also played an important role in the development of bodybuilding dependence. Moreover, experienced bodybuilders displayed more exercise dependence than inexperienced bodybuilders and weightlifters. These results indicate that bodybuilders can become dependent on the actual activity of lifting weights rather than weightlifters.

Smith and Hale (2004) examined bodybuilding dependence in competitive and non-competitive bodybuilders in both genders. Results showed that competitive bodybuilders exhibited more bodybuilding dependence than non-competitive ones, but there were no gender differences. Moreover, the study also found positive relationship between bodybuilding dependence and MD, confirming previous findings that exercise dependence is an important behavioural pattern of MD.

A recent study investigated exercise dependence and drive for muscularity in male bodybuilders, power lifters, and fitness lifters (Hale, Roth, DeLong, & Briggs, 2010). Results indicated that bodybuilders and power lifters may tend to become overcommitted in their weight lifting trainings compared to fitness lifters and may be at higher risk for developing exercise dependence. Authors suggested that drive for muscularity is clearly related to exercise dependence behaviours. Therefore, those individuals who display higher levels of drive for muscularity may be at higher risk for developing more addictive exercise behaviour patterns and even more susceptible to the negative psychological and social consequences of the addiction than those with less drive for muscularity.

1.7.3 Mood and anxiety disorders

Studies suggest that mood and anxiety disorders often co-occur in MD. Olivardia et al. (2000) examined psychiatric disturbances in muscle dysmorphic (n = 24) and normal comparison weightlifters (n = 30). Those men with MD showed higher lifetime

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prevalence of DSM-IV mood and anxiety disorders. Namely, 14 men with MD reported a lifetime history of major depressive disorder or bipolar disorder, while only six of the normal comparison men. Seven of the muscle dysmorphic men versus only one of the comparison men reported a lifetime history of a DSM-IV anxiety disorder. Authors noted that the onset of these comorbid psychiatric disorders occurred before or after the development of MD, but it seems that compulsive weightlifting may serve as a coping strategy to deal with the feelings of anxiety or depression.

A recent study also investigated the correlates of MD (McFarland & Kaminski, 2009). Multiple regression analyses suggested that higher levels of depression, anxiety, and interpersonal sensitivity were predictive factors of MD and body dissatisfaction. Interpersonal sensitivity refers to self-consciousness and sensitivity to criticism from others. The authors hypothesize that those men with higher levels of interpersonal sensitivity are more vulnerable to media influences and peer pressure, thus, they have a higher risk for MD and body dissatisfaction. In this study, those men with high levels of MD had also higher endorsement of obsessive-compulsive symptoms, hostility, and paranoid ideation.

Another study examined the psychiatric conditions and symptom characteristics associated with MD (Cafri et al., 2008). Men with a history of MD had higher rates of lifetime mood and anxiety disorders, in comparison to males without a history of MD. Men with mood disorders had major depressive disorder (n = 15 out of 23, in the MD group vs. n = 8 out of 28, in the control group) and dysthymic disorder (n = 2 out of 23, in the MD group). According to the results, men with MD suffered from panic disorder (n = 4, vs. one male in the control group), posttraumatic stress disorder (n = 2), obsessive-compulsive disorder (n = 1), specific phobia (n = 1), social phobia (n = 1), and generalized anxiety disorder (n = 1, vs. one male in the control group). The study findings of Wolke and Sapouna (2008) also pointed out the association between MD and the symptoms of anxiety, depression, and obsessive-compulsive disorder. Maida and Armstrong (2005) also found positive correlations between symptoms of MD and variables, such as anxiety and obsessive-compulsive symptoms. The study of Chandler, Grieve, Derryberry, & Pegg (2009) revealed that trait anxiety and obsessive-compulsive

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symptoms had strong relationships with overall MD symptomatology. Path analysis indicated that anxiety-related variables accounted for 77% of the variance in MD symptoms.

1.7.4 Poor quality of life and suicidal attempts

Some research indicates poor quality of life among MD sufferers. Pope, Pope, Menard, Fay, Olivardia, and Phillips (2005) compared 14 men who had MD combined with body dysmorphic disorder with 49 body dysmorphic men. Results showed that men with MD had poorer scores on both measures of quality of life enjoyment and satisfaction and mental health related quality of life than the comparison men. Another study compared men with (n = 15) and without (n = 36) current history of MD (Cafri et al., 2008). Results pointed out that men with current MD displayed higher functional impairment (measured by the Muscle Dysmorphic Disorder Inventory – Functional Impairment subscale), in a sense that the pursuit of the muscularity adversely affected their social, academic, and occupational functioning.

Although limited number of studies are available in this field, the available studies suggest that men with MD have poorer quality of life, and more suicidal attempts than the general population. In the above mentioned study by Pope et al. (2005), results also indicated that MD was associated with greater psychopathology, as men with MD were more likely to have attempted suicide, had poorer quality of life, and engaged in severe compulsive behaviours (seven men with MD had attempted suicide vs. eight did so in the body dysmorphic group); moreover, their quality of life were also poorer comparing to the body dysmorphic group and to the general population. The authors hypothesized that preoccupation with muscularity and additional physical features combined with time-consuming compulsive behaviours (e.g., excessive bodybuilding, dieting, and mirror checking) enhances the distress and functional impairment. These results are in line with previous studies that indicated a relationship between greater axis I comorbidity, functional impairment (Welkowitz, Struening, Pittman, Guardino, & Welkowitz, 2000), and increased suicide attempts (Lecrubier, 2001) in the general population.

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1.7.5 Anabolic-androgenic steroid use

1.7.5.1 Definition of anabolic-androgenic steroids

"The anabolic-androgenic steroids (AAS) are a family of synthetic drugs related to the male sex hormones (androgens), which enhance the growth of skeletal muscles (anabolic effect) and also the development of male sexual characteristics (androgenic effect)" (Amsterdam, Opperhuizen, & Hartgens, 2010). Taken in supraphysiologic doses (which means at least 600 mg of testosterone weekly for several weeks) greatly improve fat-free mass, muscle size, and strength (Bhasin, et al., 1996; Kouri, Pope, Katz, & Oliva, 1995).

Only elite athletes used these kinds of performance enhancing substances during 1950s. From the 1980s, the use of illicit AAS became widespread also in the general population (Kanayama, Hudson, & Pope, 2008; Pope et al., 2000). It is a great concern that the AAS are available on the black market and most of the users are even not aware of the mechanism and adverse health effects of these substances. Moreover, there is usually no any kind of medical checkout (e.g., blood test, liver function test) before, during, or after the AAS use, which makes the use of these illicit substances more dangerous (Pope et al., 2000, Hungarian review: Babusa & Túry, 2010; Túry & Babusa, 2012).

1.7.5.2 Prevalence of anabolic-androgenic steroid use

American studies reported a prevalence of AAS use of 4–11% for male and 2.5% for female high school students (e.g. Bahrke, Yesalis, Kopstein, & Stephens, 2000). According to the results of the U.S. national surveys, the 'Monitoring the Future' 3.5% of 10th graders reported illicit AAS use (Johnston, O'Malley, & Bachman, 2002). In another survey among adolescent boys, the lifetime prevalence of illicit AAS use was slightly less than in the national survey, 2.6% (Cafri, van den Berg, & Thompson, 2006). According to the results of a British survey, 4.4% of male and 1.0% of female college students reported current or past AAS use (Williamson, 1993). It should be noted that girls and women rarely use AAS, firstly, due to the fact that they usually do not want to develop extreme muscularity, and secondly, that they also have to face with the masculinizing effects of AAS (e.g., beard growth, deepening of the voice).

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Research evidence showed that the prevalence of AAS use is much higher in some certain populations, especially among bodybuilders, weightlifters, and prisoners (Thiblin & Petersson, 2005). For example, during the very first description of MD, 108 male weightlifters were recruited, of whom 51% (n = 55) reported AAS use (Pope et al., 1993). Kanayama, Pope, Cohane, and Hudson (2003) also found a 50% (n = 48) prevalence rate for AAS use among 96 male weightlifters. A recent study found similarly high prevalence rate, as 44% (n = 102) of 233 male weightlifters reported lifetime AAS use (Pope, Kanayama, & Hudson, 2012).

Some Hungarian data are also available relating to the prevalence of AAS use. One drug use survey study revealed that the lifetime prevalence of AAS use among Hungarian high school students was 8.8% (Domokos, 2005). The first study of MD in Hungary found 9.3% prevalence rate of AAS use among 140 male bodybuilders (Túry, Kovács, & Gyenis, 2001).

1.7.5.3 Muscle dysmorphia and anabolic-androgenic steroid use

Research suggests that body image dissatisfaction can increase the risk of AAS use and dependence (Brower, 2002); moreover, the pursuit of muscularity is also a reason for steroid use (Olivardia et al., 2000). Previously, during the first description of MD, Pope et al. (1993) found far more higher prevalence rate of AAS use since all the four men with MD had also reported a lifetime history of AAS use. Later, they found a lower prevalence rate, since six out of 15 men with MD reported a history of AAS use (Pope et al., 1997). In a study by Kanayama et al. (2003), 17% (n = 8 out of 48) of the AAS users reported a lifetime history of MD. Similar to this result, Pope and Katz (1994) found that 18.2% (n = 16 out of 88) of AAS user weightlifters reported a history of MD versus none of the comparison non-steroid user weightlifters (n = 66). Other study results also suggested that AAS user weightlifters (Kanayama et al., 2006) and AAS user body builders (Cole, Smith, Halford, & Wagstaff, 2003) displayed marked symptoms of MD comparing to the non-users.

The following question is a disturbing one, but there were several debates relating to this topic: whether MD symptoms are a cause or an effect of AAS use? Nowadays a

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consensus has been established, which confirms that the symptoms of MD could be the cause for AAS use, meaning that body image pathology precipitates the use of AAS (Rohman, 2009). Olivardia et al. (2000) examined MD symptomatology in weightlifter men with MD (n = 24) and comparison weightlifters without MD (n = 30). They found that 11 men with MD and only two normal comparison weightlifters reported AAS use.

The reason why MD sufferers are more vulnerable than normal weightlifters or bodybuilders to AAS use and dependence is the salient underlying psychopathology of MD itself (Rohman, 2009). Although, men with MD may develop large muscles with the use of AAS, due to their body image disorder they still perceive themselves to be small and weak. As a consequence, they increase the dosage of steroids and may use them more frequently.

1.7.5.4 Adverse effects of anabolic-androgenic steroids

AAS use has several kinds of short and long term adverse effects. Many of them are caused by that the steroid abuse suppresses the normal production of hormones, which may cause reversible or irreversible changes. In fact, the use of AAS very rarely causes death, but the potential side effects may reduce the life expectancy.

1.7.5.4.1 Physical side effects of anabolic-androgenic steroids

Gynecomastia is a common side effect of AAS use, which means the growth of the breast tissue under the nipples, caused by the imbalance of testosterone-estrogen hormones during the period of AAS use. Once it has developed, the condition is irreversible and the enlarged breast can be removed only surgically. According to the results of a survey, 10-34% of the AAS users experience gynecomastia (Evans, 2004). Another long-term physical side effect of AAS use is the increased level of LDL-cholesterol and the decreased level of HDL-cholesterol, which increases the risk of *artherosclerosis* (Hurley et al., 1984). Artherosclerosis is the thickening and hardening of the walls of medium- and large sized arteries and responsible for coronary artery disease and stroke.

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Many men also report the shrinking of their testicles (*testicle atrophy)* while they are on steroids. This is caused by the suppression of natural testosterone level, which inhibits production of sperm. However, this side effect is only temporary, since the size of the testicles usually returns to their normal size after a few weeks of discontinuing AAS use as normal production of sperm resumes. Reduced sexual function and temporary infertility can also occur in males. According to the results of a survey, 40-51% of the AAS users experience testicle atrophy (Evans, 2004).

Long-term AAS use is also a great concern, since it may cause prostate enlargement. Some study also pointed out the relationship between AAS use and prostate cancer (Creagh, Rubin, & Evans, 1988). The high doses of oral AAS are highly hepatotoxic, as the steroids are metabolized and can cause *liver toxicity*. In more serious cases there is also a higher risk for fatal liver cysts, liver changes, and cancer (Stimac, Milic, Dintinjana, Kovac, & Ristic, 2002).

Steroids also can cause *myocardial hypertrophy*, which can increase the risk for cardiac arrhythmias, hypertension, heart attacks, and sudden cardiac death (Karila et al., 2003; Sullivan, Martinez, & Gallagher, 1999). Anabolic steroids have been linked with cardiovascular issues, e.g., *high blood pressure,* or *headaches,* and *kidney failure.* Another common side effect of AAS use is the development of *acne*, since steroids enlarge the sebaceous glands in the skin. These enlarged glands produce an increased amount of oil. Research data show that 40-54% of the AAS users reported the presence of acnes (Evans, 2004). AAS use can also accelerate the rate of premature *baldness* for those males who are genetically predisposed.

Anabolic steroid use in adolescence can possibly *stunt the growth potential*. This is because of the premature closure of the epiphysial cartilage, caused by aromatizable steroids, which finally leads to a possible growth inhibiting effect, and could results in a shorter adult height. This side effect is irreversible. The use of AAS has been also linked with *ligament and joint injury*. Steroids increase muscle mass and muscle strength, but the joints and ligaments can not adapt. Putting too much strain on

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ligaments that cannot properly anchor the new muscle strength, can result in severe injury.

1.7.5.4.2 Psychiatric side effects of anabolic-androgenic steroids

Even though the use of AAS rarely cause immediate acute medical side effects, the use of these substances can be dangerous because of their psychiatric side effects. Steroids may induce changes in the personality and behaviour, which can have an adverse effect on the social, occupational, and other important areas in life.

Many studies suggested that AAS use can cause *hypomania* or *mania*, sometimes co-occurring with increased *aggressiveness* and mild irritation (e.g., Choi and Pope, 1994; Kouri, Pope, & Oliva, 1996; Pope and Katz, 1990). The degree of these effects is mostly based on the dosage level of the AAS. The manic symptoms were described by irritability, aggression, grandiose beliefs, euphoria, hyperactivity, violence, and dangerous behaviour. These manic symptoms are occasionally accompanied by psychotic symptoms, such as beliefs about having a special power (Pope et al., 2000; Pope & Katz, 1988). Studies which examined the mood disorders and aggression among those AAS users who used high dose steroids (> 1000 mg/week) found that 23% of the AAS abusers developed mania, hypomania, or major depression, and 3-12% had psychotic symptoms (Pope & Katz, 1994; Pope, Kouri, & Hudson, 2000).

Studies also documented *depressive symptoms* associated with AAS use (Brower, 2002; Malone & Dimeff, 1992; Malone, Dimeff, Lombardo, & Sample, 1995; Pope & Katz, 1994). Depressive symptoms are more likely to present in the withdrawal phase of AAS use. Relevant to these studies, some research also reported suicides related to AAS use (Brower, Blow, Beresford, & Fuelling, 1989; Papazisis, Kouvelas, Mastrogianni, & Karastergiou, 2007; Thiblin, Runeson, & Rajs, 1999). Most of the mood changes are only temporarily and experienced for short-term during or after the AAS use. However, suicidal cases are of great concern. One study examined older powerlifters and documented that 3 of the 8 death were caused by suicide (Parssinen, Kujala, Vartiainen, Sarna, & Seppala, 2000). Recent study findings also indicated that suicide was a more common cause of death among AAS users than among other substance users (Petersson

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et al., 2006). Another study found that 6.5% of the AAS user bodybuilders attempted suicide after discontinuing steroids (Malon et al., 1995). However, there are some studies that have not documented such mood changes during AAS use (Basaria Wahlstrom, & Dobs 2001; Bhasin et al., 1996; Tricker et al., 1996).

Sexual dysfunctions are also associated with AAS use (Pope, Phillips, et al., 2000). The dysfunction can be experienced in extremities. One extremity is the increased libido and the increased sexual drive, which usually occur during the active phase of AAS. The other extremity is the decrease of libido and sexual drive, sometimes accompanied by impotence, which can be experienced during withdrawal from AAS when the natural testosterone level is still suppressed (Pope, Phillips, et al., 2000).

The long term use of AAS may also lead to *dependence*. One study pointed out that AAS may cause withdrawal symptoms, and those men who discontinued AAS use reported depression, decreased libido, energy level, and self-esteem (Bahrke, Yesalis, & Wrigh, 1990). Although the AAS do not have strong euphorigenic effects, the dysphoric effects of the withdrawal may contribute to the development of their dependence (Pope & Katz, 1988). Brower (2002) proposed a two-stage model for AAS dependence. In the first stage, subjects use AAS for their anabolic (muscle gaining) effects. During this stage, the AAS users also experience the psychological effects of AAS, since the achievement of their goals (i.e., muscle gain) reinforces their use. In the second stage, the psychoactive effects of the AAS use develops and through the high doses of steroids affect the brain mediated reward systems. Some AAS users are at risk for dependence because of the withdrawal symptoms (e.g., fatigue, depression, low energy levels) and also because discontinuity of AAS is usually accompanied by some decrease of muscle mass and strength. Brower, Eliopulos, Blow, Catlin, and Beresford (1990) documented that 57% of the AAS user male weightlifters fulfilled the DSM-III criteria for dependence. Another study examined the symptoms of AAS dependence and withdrawal among 49 male weightlifters (Brower, Blow, Young, & Hill, 1991). Eighty-four percent of the sample reported different symptoms of withdrawal: 52% reported steroid craving, 43% fatigue, 41% depressed mood, 24% loss of appetite, 20% insomnia, 20% reduced sex drive, 20% headache, and 29% restlessness.

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Another great concern relating to AAS use is that in most cases the use of AAS is associated with *other substance use* as well. For instance, a study found that 79% of the AAS users also used some kind of psychotropic substances (Petersson et al., 2006).

1.7.5.5 Characteristics of anabolic-androgenic steroid users and risk factors for anabolic-androgenic steroid use

Although, AAS use is a growing public health problem and the adverse physical and psychiatric effects of these substances are of great concern, the risk factors for AAS use are still poorly understood. Recent studies have been exploring the association between AAS use and various psychological correlates to find out the risk factors for AAS use. Most of these studies focusing on that population which is at risk for AAS use, namely on male weightlifters or bodybuilders. Studies suggest that AAS users may have lower levels of self-esteem (Brower, Blow, & Hill, 1994; Blouin & Goldfield, 1995) and narcissistic or antisocial personality characteristics (Burnett & Kleiman, 1994; Yates, Perry, & Andersen, 1990).

Kanayama et al. (2006) examined body image pathology, self-esteem, and attitudes toward male roles in AAS user (n = 48) and AAS non-user (n = 41) male weightlifters. Results indicated that AAS users displayed greater MD symptoms and had elevated scores on the Eating Disorders Inventory (Garner et al., 1983). Moreover, long-term AAS users had higher levels of MD symptomatology, and stronger endorsement of conventional male roles than non-user. AAS users and non-users did not show any difference relating to self-esteem suggesting that AAS use may not be associated with low self-esteem, but rather with poor body image.

For the examination of risk factors for AAS use, Kanayama et al. (2003) compared AAS user (n = 48) and AAS non-user (n = 45) male weightlifters. Relating to the psychosocial factors, AAS users reported poorer relationship with their fathers and greater conduct disorder during their childhood than non-users. Relating to the physical status, AAS users were less confident about their body appearance. Finally, AAS users had higher rates on other illicit substance use or dependence than non-users.

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A study aimed to characterize the relationship between increased serum level of testosterone, mood, and personality among AAS user and non-user weightlifters (Perry et al., 2003). Results indicated that increased testosterone level was associated with self-reported violence and aggression. Moreover, AAS users displayed more cluster B personality disorder related characteristics than non-users.

In a cross-sectional cohort study 233 male weightlifters were recruited, of whom 44% (n = 102) reported lifetime AAS use (Pope et al., 2012). The study aimed to assess the childhood and adolescent attributes retrospectively. According to the results, conduct disorder, poor relationship with one's father, and adolescent concerns with muscularity and body appearance emerged as strong risk factors. It should be also noted that only one study found significant relationship between BMI, AAS use, overeating, and the use of food supplements (Neumark-Sztainer, Story, Falkner, Beuhring, & Resnick, 1999). However, other studies have not found similar relation (McCabe & Ricciardelli, 2001b; McCabe & Ricciardelli, 2003).

Other studies examined risk factors associated with AAS use among adolescents. Study results indicated that AAS users are more likely to use other illicit drugs as well (Bahrke et al., 2000; DuRant et al., 1995). The prevalence rate of AAS use was significantly higher among male students participated in sports (e.g., football, wrestling, weightlifting, and bodybuilding) than students who were not active in sports (Bahrke et al., 2000; DuRant et al., 1995).

Cafri et al. (2005) proposed a model for potential risk factors that may lead to body change strategies, including AAS use in males (see Figure 1). The theoretical model consists of variables that may contribute to dysfunctional body change behaviours in males. The model involved six main variables which can lead to a variety of health risk behaviours: (1) biological factors, (2) societal factors, (3) psychological functioning, (4) social body comparison, (5) body image dissatisfaction, (6) sports. The authors suggested that these factors may place an individual at high risk for exhibiting health risk behaviours.

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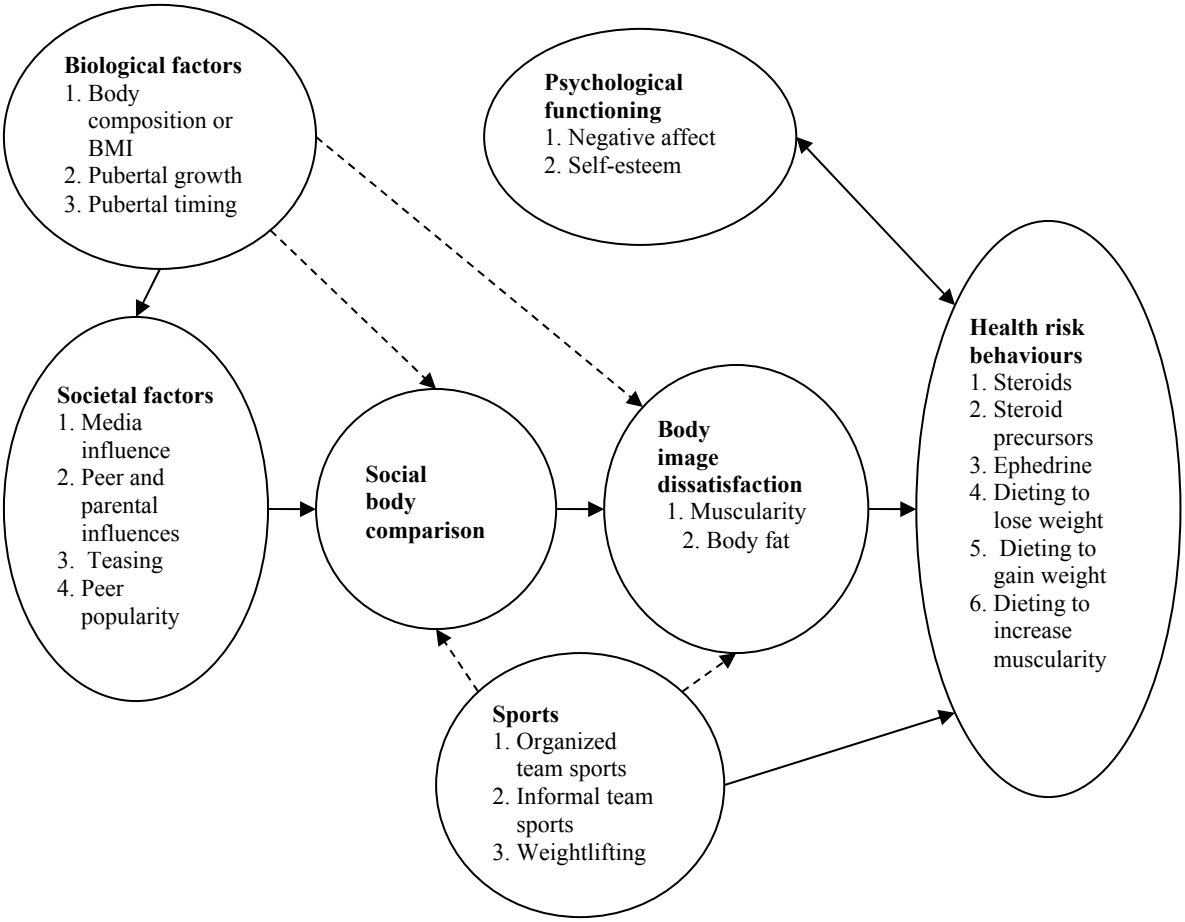

Figure 1. Model for putative risk factors for body change strategies in males (Cafri et al., 2005).

In conclusion, the abuse of AAS is a public health problem and may be related with adverse physical, behavioural, and psychiatric effects. Although the risk factors for AAS use are poorly explored, the deeper understanding of AAS use may help to identify those who are at risk for AAS use, and could contribute to the development of effective intervention programs.

1.8 Etiology of muscle dysmorphia

Many approaches help the clearer understanding of MD (Hungarian review: Babusa & Túry, 2010; Túry & Babusa, 2012). Some authors propose multidimensional models for the etiology of MD, which differentiate predisposing, precipitating, and maintaining factors. These models suggest that MD is a complex psychosomatic disorder with biological, psychological, and sociocultural components.

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Olivardia (2001) described a brief biopsychosocial model for the development of MD. The model involved genetic factors, drive for muscularity, low self-esteem, appearance-related social pressures, and body-image consciousness.

Rhea and Lantz (2000) proposed a psychobehavioural model of MD, including six factors (see Figure 2). The specific behavioural and psychological characteristics of MD can be divided into two major categories: nutrition and physique concerns. The first category, nutrition, includes behaviours relating to pharmacological use, supplement use, and dietary behaviour. Pharmacological use involves the use of steroids and other illicit hormones in order to increase muscular size. Supplement use is concerned with the use of legal substances designed to enhance the quality of a workout (e.g., energy drinks, creatine). Dietary behaviour involves the strict monitoring of proteins, carbohydrates, and fats in order to increase muscle size. This model suggests that subjects with MD are more likely to engage in these nutritional behaviours in pursuit of enhancing muscular, well-defined physiques than are non-dysmorphic weightlifters. The second category, physique concerns, is characterized by concerns relating to body size/symmetry, physique protection, and exercise dependence. Body size/symmetry focuses on the degree of satisfaction with muscle size and shape. Physique protection comprises behaviours designed to avoid having the body viewed by others (e.g., wearing bulky clothing, or avoiding situations where the physique may be exposed). Exercise dependence involves preoccupation with exercise, maintaining a rigid schedule of intense exercise, feeling guilty because of the missed exercises, and exercising even when ill or injured. The model was partially corroborated by Olivardia et al. (2000), who compared muscle dysmorphic weightlifters with a normal group of weightlifters. The data suggest that dysmorphic weightlifters were significantly different from non-dysmorphic weightlifters in a number of areas including eating attitudes and anabolic steroid use. Moreover, the authors found that dysmorphic weightlifters expressed significantly greater body dissatisfaction than did non-dysmorphic weightlifters.

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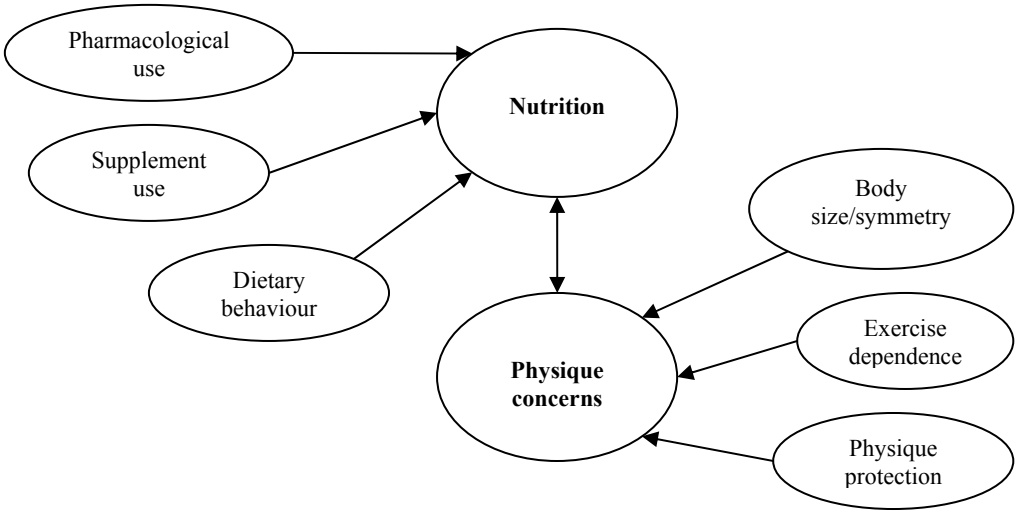

Figure 2. Psychobehavioural model of muscle dysmorphia (Rhea & Lantz, 2000).

Lantz, Rhea, and Mayhew (2001) proposed a model that included three major categories (see Figure 3): (1) precipitating variables (self-esteem and body dissatisfaction), (2) psychobehavioural characteristics (body size/symmetry, dietary constraints, use of psychopharmacological aids, use of dietary supplements, exercise dependence, and physique protection), and (3) negative outcomes (alienation and narcissism). The authors suggest that the development of MD is directly influenced by body dissatisfaction.

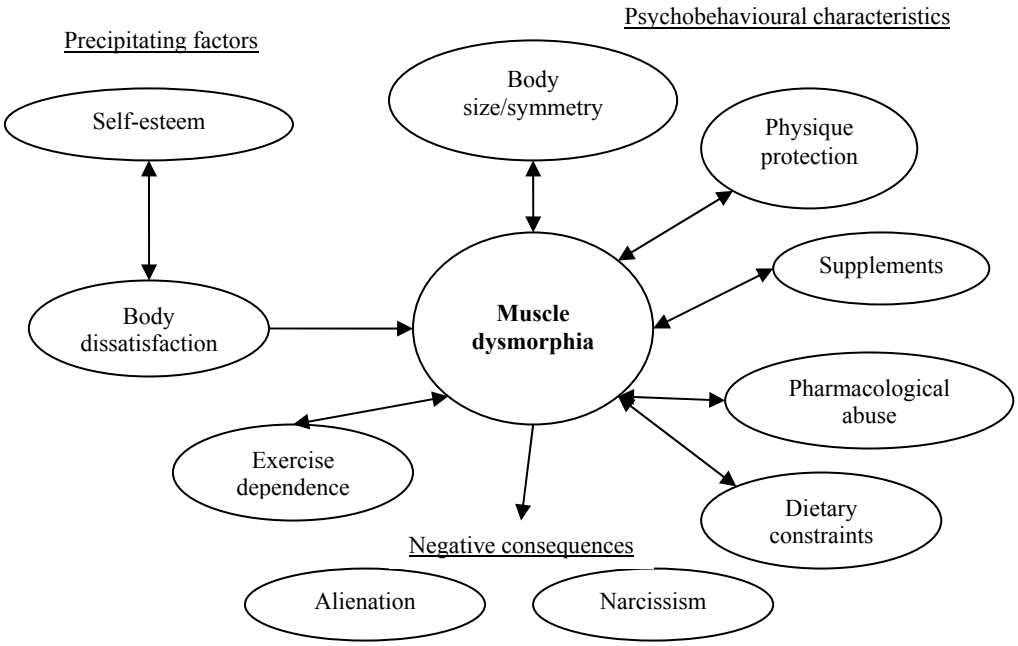

Figure 3. Model for the development of muscle dysmorphia (Lantz, Rhea, &Mayhew, 2001).

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In a recent model, Grieve (2007) involved those categories into the etiological model of MD which represent the biopsychosocial model of psychopathology (Kiesler, 1999). The model consists of nine factors, which can be divided into four major categories – see Figure 4: (1) socioenvironmental factors (i.e., media influences, sport participation), (2) emotional factors (i.e., negative affect), (3) psychological factors (i.e., body dissatisfaction, ideal body internalization, self-esteem, body distortion, perfectionism), (4) physiological factors (i.e., body mass). Most of the variables are interacting with each other.

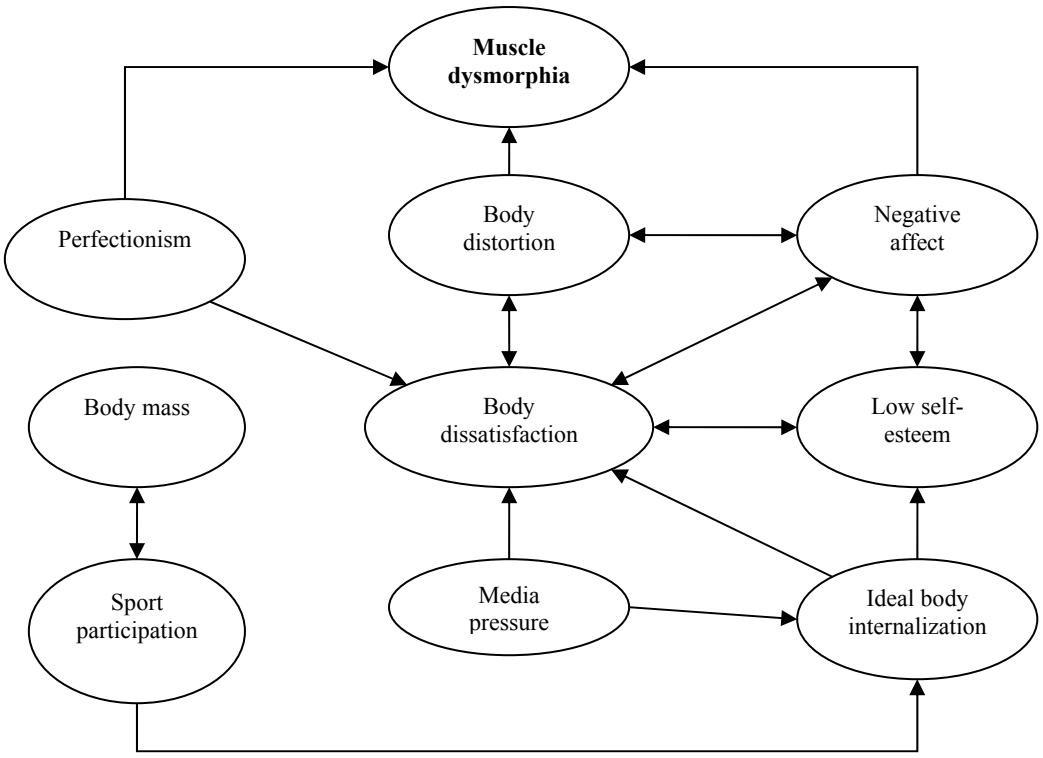

Figure 4. Proposed etiological model for muscle dysmorphia (Grieve, 2007).

1.8.1 Biological factors

1.8.1.1 Neurobiological factors

The neurobiological factors of MD are still under research. Since MD has been conceptualized as a subtype of body dysmorphic disorder, similar neurobiological pathology or genetic predisposition are assumed (Rohman, 2009).

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1.8.1.2 Body mass

Another biological factor that may contribute to the development of MD is body mass index (BMI). BMI measures body composition and body fat calculated from body weight and height. (The formula for BMI is as follows: body weight (kg)/ height (m) ^{2}). The BMI ranges and categories are as follows: a BMI of less than 18.5 is regarded as underweight, a BMI range of 18.6–24.9 is considered as normal weight, between 25–29.9 is regarded as overweight, and above 30 is considered as obese.

BMI was also included in the conceptual model of MD; however, it has also been noted that the relationship between BMI and MD has not been established yet (Grieve, 2007). Although, research has supported a strong association between BMI and body dissatisfaction, the role of BMI as a contributing factor to MD is still inconsistent (Cafri et al., 2005).

Some authors hypothesize an inverse relationship between BMI and the pursuit of muscularity, as low BMI would suggest small body size and muscularity, therefore an increased desire towards muscle gain is assumed (Cafri et al., 2006). McCabe and Ricciardelli (2001a) found that higher BMI was correlated with higher levels of body dissatisfaction among preadolescent boys. Furthermore, boys with higher BMIs dieted more often and were more likely to engage in body-changing techniques (e.g. eating less/more to lose/gain weight, exercise) comparing boys with normal BMIs. Conversely, another study found association between lower BMI, steroid use, overeating, and use of food supplements (Neumark- Sztainer et al., 1999). Cafri et al. (2006) found that higher BMI was a predictor of dieting to gain weight. As for the explanation, weight lifting males have a higher BMI and may also be dieting to gain weight in order to increase their muscle mass. Contrariwise, a study conducted among adolescent males indicated that lower BMI predicted higher importance on muscularity, more peer influence, and higher perceived pressure from others towards muscle gain (Ricciardelli, McCabe, Lillis, & Thomas, 2006).

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It should be noted that, the interpretation of BMI has to be treated carefully in this respect, as high BMI may indicate either a high level of muscle mass or a high level of body fat, and lower BMI may also indicate lean musculature. Therefore, the use of the "fat-free mass index" (FFMI; Kouri et al., 1995) as an objective measure of an individual's degree of muscularity would be more appropriate for the measure of male body composition.

The formula for FFMI in males is as follows:

$$FFMI = \frac{LBM}{H^2} + 6.1 \times (1.8 - H),$$

In this formula LBM refers to lean body mass in kilograms and H height in meters. Lean body mass is the total body weight minus the percentage of body fat[1].

The FFMI ranges and categories are as follows: a FFMI range of 16–17 is considered as very low level of muscle, between 18–21 is regarded as average/normal muscle, 22–24 is considered as noticeably muscular, and above 25 is regarded as upper level of muscularity attainable without steroids. This formula has been developed only for men, thus no similar formula with the cut-off value suggesting steroid use is available for women. It also has to be noted that the above described ranges and categories can be applied to men with a low or moderate body fat. In other cases the FFMI can reach above 26 without steroid use.

1.8.1.3 Pubertal timing

Pubertal timing has been also investigated as a biological risk factor of MD; however, similarly to BMI, the results are inconsistent. Regularly, puberty launches significant bodily changes, as well as muscular growth in young males. It can be hypothesized that, later maturing boys may have less muscular physique than early maturing peers. Therefore, they are at higher risk for engaging even in harmful muscle-enhancing techniques (Cafri et al., 2006). O'Dea and Abraham (1999) found that males who had lately reached pubertal growth reported more body dissatisfaction and were more likely to engage in muscle building techniques (e.g., use of food supplements) comparing to

[1] Body fat can be estimated by various methods, such as measuring the thickness of skin folds on different body parts with calipers or electrical impedance measuring techniques.

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males with normal pubertal timing. Results of a longitudinal study indicated that both early and late maturing boys engaged in body change strategies in relation to muscular ideal (McCabe & Ricciardelli, 2004). However, the earlier maturing boys were more susceptible to maladaptive body change behaviours than the later maturing boys.

1.8.2 Psychological factors

1.8.2.1 Self-esteem

Research has shown that low self-esteem often contributes to the onset of an eating disorder (e.g., Button, Sonuga-Barke, Davies, & Thompson, 1996; Cervera et al., 2003; Fairburn, Cooper, & Shafran, 2003; Halvorsen & Heyerdahl, 2006). Moreover, positive relationships were found between low self-esteem, depression, and body dissatisfaction in both males and females (Blouin & Goldfield, 1995). One study results indicated that both body dysmorphic disordered and eating disordered patients reported almost the same low levels of self-esteem (Rosen & Ramirez, 1998). Thus, it was hypothesized that low self-esteem may also be a key element in the development of MD. Furthermore, Pope, Phillips, et al. (2000) proposed that the association between poor body image and low self-esteem may be stronger in men than in women.

The relationship between low self-esteem and MD is well-documented in the literature (Grieve, 2007; Grieve & Helmick, 2008; Lantz et al., 2001; Pope, Phillips, et al., 2000). These studies suggest a negative relationship between self-esteem and MD symptoms, as men with MD display lower levels of self-esteem. Often, a low level of self-esteem serves as a motivational basis for the behavioural symptoms of MD, for instance weightlifting (Crocker, 2002). Olivardia (2001) emphasized that in case of men with MD, self-esteem is solely based on their appearance, while in others without the symptoms of MD it consists of several factors, including appearance. Those men whose self-esteem is dependent upon their appearance may engage in appearance-improving behaviours (Crocker, 2002). These behaviours can be excessive exercise, rigid diet, or weightlifting/bodybuilding activity. The increased drive for a more muscular body can be considered one way of gaining some acceptance or respect from others (Pope, Gruber, et al., 2000). Often, the reason for exercising determines whether the exercise improves or deteriorates health status and self-esteem. Males who exercised to enhance

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their appearance rather than to improve their health had lower self-esteem, higher levels of body dissatisfaction, and disordered eating (Strelan & Hargreaves, 2005). Olivardia et al. (2004) also pointed out that higher levels of muscle belittlement and body image dissatisfaction in males were associated with lower self-esteem, depression, and eating pathologies.

Some authors indicated that body satisfaction has a central role in self-esteem. Based on this theory, a research reported a significant positive relationship between self-esteem and body attitudes (Mintz & Betz, 1986). According to the results, men and women who had more positive attitudes about their bodies had higher levels of self-esteem. Sometimes self-esteem is mediated by body satisfaction and vice versa, body satisfaction is mediated by general self-esteem (Davis, Elliot, Dionne, & Mitchell, 1991).

1.8.2.2 Body image dissatisfaction and distortion

Body image dissatisfaction usually refers to the feelings about the perceived discrepancy between one's ideal and actual bodily appearance (Keeton, Cash, & Brown, 1990). Although, body dissatisfaction in women has been widely documented, the number of papers focusing on concerns related to men's appearance has increased only in the last few decades. Studies have documented muscle dissatisfaction and a desire for a more muscular ideal body among men (Fredrick et al., 2005; Lynch & Zellner, 1999).

Over the last few decades males are becoming more dissatisfied with their bodies and recently, many men have developed a drive for muscularity (McCreary, 2007). According to the results of the studies conducted over the last 25 years in the U.S., more men are reported to be dissatisfied with their bodies and muscularity than two decades ago. In 1972, 15% of the men reported body dissatisfaction (Berscheid et al., 1973). In 1985 this number increased to 32% and by 1997 to 45% (Garner, 1997). In details, in 1972, 18% of men were dissatisfied with their chest, and 25% with their muscle tone. By 1997, 38% of men were dissatisfied with their chest, and 45% with their muscle size. Another study pointed out that 95% of men are dissatisfied with some aspects of their bodies (Mishkind et al., 1986).

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Research has shown that different body ideals exist for men and women. The ideal regards to men is the muscular ideal, while the ideal concerns to women, is the thin body ideal (e.g. Fisher, Dunn, & Thompson, 2002; McCreary & Sasse, 2000). Given these different body ideals, women experience pressure towards thinness, and men often report pressure to obtain and maintain muscularity. Research has pointed out that men generally would like to be more muscular (Ricciardelli, McCabe, & Banfield, 2000). One study found that 91% of college men reported that they wanted to be more muscular, while no one wanted to be less muscular (Jacobi & Cash, 1994). According to the results of another study, male college students chose an ideal body with about 11 kilograms more muscular than their actual bodies, with a primary increase of their biceps, shoulders, and abdomens (Olivardia et al., 2004). McCaulay, Mintz, and Glenn (1988) found that 85% of men and 56% of women wanted to be more muscular, actually women wanted to be more toned.

A study across three different Western countries (Austria, France, and the U.S.) found that men's ideal bodies were 13 kilograms more muscular than their actual bodies (Pope, Gruber, et al., 2000). Furthermore, men estimated that women would prefer a male body about 14 kg more muscular than their actual bodies. However, the study was also able to point out that women actually did not prefer very muscular male bodies, but instead chose an average one. The authors indicated that the discrepancy between males' actual and ideal bodies may be a contributing factor in the development of body image disorders, including MD, and men with pathological drive for muscularity may be at risk for developing MD.

Although the findings are heterogeneous in terms of the study samples, study designs, and outcome measures, research revealed that the prevalence of muscle dissatisfaction has been increasing among men. Moreover, some research has pointed out that the drive for muscularity may be a precursor to the development of MD (Olivardia, Pope, & Hudson, 2000; Pope, Phillips, et al., 2000).

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Body image distortion is also hypothesized to be a factor in the development of MD (Grieve, 2007; Grieve, Truba, & Bowersox, 2009; Olivardia, 2001). Body image disturbance has been long identified as a contributing factor of eating disorders, which is so prominent that has been involved in the diagnostic criteria of AN (American Psychiatric Association, 2000). Body image distortion is defined as the "disturbance in the way in which one's body weight or shape is experienced" (American Psychiatric Association, 2000). In case of AN, body image disturbance usually refers to the distortion of body size as individuals with AN often believe that they are larger than their actual body size. Men with MD also report body image distortion with the difference that they perceive themselves to be smaller and weaker than they actually are (Olivardia, 2001). According to the conceptual model of MD (Grieve, 2007) body image distortion is influenced by body image dissatisfaction and vice versa. In other words, the higher the body image disturbance, the higher the body image dissatisfaction. Grieve et al. (2009) emphasized that individuals with body image distortion are at higher risk for developing MD.

1.8.3 Sociocultural factors

1.8.3.1 Media

Many research documented the relationship between media exposure, body image dissatisfaction, and eating disorder pathology among girls and women (e.g. Cafri, Yamamiya, Brannick, & Thompson, 2005; Stice, Schupak-Neuberg, Shaw, & Stein, 1994; Thompson et al., 1999). In the last two decades research have begun focusing on the association between muscular male media images and body dissatisfaction among boys and men (Agilita & Tantleff-Dunn, 2004; Leit et al., 2002). The overwhelming majority of boys and men are exposed to the media images, such as movies, advertisements, magazines, and action figures that usually portray muscular male bodies, which enhances the desire for a muscular and well-built physique. Studies pointed out the role of the media in self-esteem, the development of body image dissatisfaction, and MD (e.g., Tager, Good, & Morrison, 2006). However, some authors also emphasize that the media influence is often mediated by the level of internalization and appearance comparison (Hargreaves & Tiggemann, 2004; Smolak, Murnen, & Thompson, 2005).

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Similarly as the media-communicated female body ideal has become thinner over the years, the male models and actors have become more muscular over the last twenty years (Pope, Phillips, et al., 2000). The infiltration of hypermuscular male bodies into the media has resulted in the increase of males' social comparison. This comparison may have a relevant role in body image dissatisfaction (Grieve, 2007).

Research shows that the media's portrayal of muscular ideal plays a significant role in the increase of the drive for muscularity in men (McCreary & Sasse, 2000). In many Western societies men are exposed to several media sources that represent the ideal male body more muscular than the average male body. Thus, the media provided an influential basis for a desire to attain the current muscular male ideal body among males (Pope, Phillips, et al., 2000).

In the last two decades the market for men's fitness magazines has skyrocketed (e.g., Men's Fitness, Men's Health, Muscle & Fitness). For instance, the paid circulation of Men's Health in the U.S. raised more than sixfold in seven years, from 250,000 in 1990 to 1,5 million in 1997 (Cottle, 1998). One of the most famous fitness magazines, the Muscle & Fitness is circulated in 22 countries and has a readership of more than seven million people worldwide (Etcoff, 1999). The magazine has a circulation of half a million per month alone in the U.S. (Ulrich, 2005). Contrary to the 'hard-core' bodybuilding magazines (e.g., Pump & Flex), these fitness magazines usually do not depict very huge and unrealistically hypermuscular male bodies; however, they still strongly focus on muscular and well-developed male body appearance. Most of the advertisements in these fitness magazines highlight diet products and muscle-growing supplements. For example, in Men's Health, 35% of the advertisements were performance-enhancing supplements that advocated muscle gain and fat loss (Labre, 2005). Although, most of these magazines have words like "health" and "fitness" in their titles, they promote the benefits to being muscular highly in comparison to the benefits to being healthy and fit (Pope, Phillips, et al., 2000). One study showed that those males who reported more fitness magazine reading had lower levels of self-esteem, displayed higher levels of body dissatisfaction, were more concerned about

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their muscularity, and also used more dietary supplements to increase their muscle mass (Hatoum & Belle, 2004). Moreover, fitness magazine reading was correlated with the increased intention of steroid use among those males who were not using steroids (Morry & Staska, 2001).

Studies have also investigated the direct effects of the media's portrayal of the ideal male body and body image dissatisfaction among males. Lorenzen, Grieve, and Thomas (2004) exposed men either to muscular or average males' photographs. Results indicated increased body image dissatisfaction post-exposure in those men who were exposed to photos of muscular men. Baird and Grieve (2006) exposed men to magazine advertisements that contained either male models plus the products or only the products. Men who were exposed to advertisements with male models reported higher body image dissatisfaction post-exposure than those who were exposed only to the products. Leit et al. (2002) found similar results in their study when they exposed men to advertisements showing muscular men or neutral advertisements. Those who were exposed to the muscular images displayed greater discrepancy between their perceived level of muscularity and the ideal body, resulted in greater body image dissatisfaction.

In the etiological model of MD Grieve (2007) proposed that media exposure directly influences body image dissatisfaction through different mechanisms. One possible mechanism is social comparison: the media communicated male body ideals are attractive and muscular. The exposure of such ideals may result in contrast effect in that men evaluate their own bodies as less attractive and muscular compared to the media ideals. Through this effect social comparison enhances body dissatisfaction. Another possible mechanism that decreases the levels of body satisfaction is the increase of anxiety and self-consciousness about a problem, namely not being muscular enough, and also providing a solution to the problem. Those men who are more susceptible to this media message also have higher levels of body dissatisfaction and they are at higher risk to develop MD than those who are less vulnerable (Grieve, 2007).

To conclude, the increased exposure to the media and the muscular ideal play an influential role in the increase of drive for muscularity and some related disturbances. In

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the last few decades the Western cultures seem to have placed an increasing value on the male body. For instance, the proportion of partially undressed muscular male models in women's magazines rose from 3% in 1950 up to 35% in 1990 (Pope, Phillips, et al., 2000). Whereas, in those countries and cultures where the media do not emphasize the muscular ideal, men report lower levels of body image dissatisfaction (Yang et al., 2005). One study conducted in Taiwan, showed that the Asian culture is less focused on the muscular male body comparing to the Western cultures (Yang et al., 2005). Moreover, the study also revealed that Taiwanese men were less likely to use steroids and experience symptoms of MD than U.S. men. The study was also able to highlight the cultural differences in the importance of muscular male body appearance and related body image disturbances. Hungarian studies are still missing in this field; however, the cultural differences would be interesting in this respect.

1.8.3.2 Peer experiences and parental influences

Recent research has shown that peer-experiences, specifically appearance- and weight related teasing in childhood can also be a relevant factor in the development of eating and body image disorders (Thompson, Cattarin, Fowler, & Fisher, 1995). According to the study results of Thompson et al. (1995), the frequency of childhood teasing had a strong relationship with body image and eating disturbances. Studies also suggest that childhood weight related teasing is a predictor for increased body dissatisfaction and eating disturbances (Eisenberg, Neumark-Sztainer, & Story, 2003; Stice, 2002). Childhood teasing and bullying experiences relating to the lack of musculature or weight has been identified as a risk factor for MD in males. Men with MD often report a history of weight related (being underweight or overweight) teasing during childhood and adolescence (Olivardia, 2001). As the consequence of this childhood bullying experience, they become preoccupied with their body appearance and physique to make an end of the harassment.

Pubertal timing may also play an important role in the development of MD (Cafri et al., 2006). During adolescence, boys are getting more muscular so that they also get closer to the muscular male body ideal. Boys who experience delayed puberty have less developed physique and are more likely to experience childhood teasing. As a

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consequence, they are more likely to engage in extreme body change strategies and harmful muscle-growing behaviours (McCabe & Ricciardelli, 2001a, 2004).

Based on the aforementioned evidences, one study aimed at investigating the relationship between MD, childhood bullying experiences, and some related mental health problems in a sample of male bodybuilders (Wolke & Sapouna, 2008). According to the results, 21% of the bodybuilders reported childhood bullying victimization. Those bodybuilders who reported higher frequencies of regular childhood teasing were more likely to develop MD symptoms. Moreover, results also indicated that childhood bullying victimization and MD had a strong relationship with low self-esteem, anxiety, and symptoms of depression and obsessive-compulsive disorder. Study results also revealed that the association between childhood bullying experience, global psychopathology, and low self-esteem was mediated by MD.

Increasing peer popularity may also lead to the engagement in muscle-gaining techniques (McCabe, Ricciardelli, & Finemore, 2002). O'Koon (1997) pointed out that the main reasons for steroid use among adolescent boys were to increase their popularity among peers and also to increase their personal appeal.

Studies have shown that parental influences also have a great role in the development of increased drive for muscularity (Hungarian review: Varga& Babusa, 2012). Ricciardelli and McCabe (2004) found that the perceived parental pressure to achieve the muscular ideal was associated with weight and muscle gain strategies in adolescent boys. Although both parents have a strong influence on child's body image and body-esteem, research indicate that specifically fathers have an even stronger influence on their adolescent boys' body image and increased muscle-gaining strategies (McCabe & Ricciardelli, 2003; Vincent & McCabe, 2000).

In conclusion, the evidence suggests that the media, peer, and parental influences contribute to the drive for muscularity in adolescent boys. Therefore, Stanford and McCabe (2005) examined the influence of media, parents, and peers on adolescent boys' body image and body change strategies. Results indicated that parents had the

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strongest influence on body image, and the media and peers had a lesser influence. However, the messages about shape and increasing muscles from each of the sociocultural sources (media, parents, and peers) predicted muscle-gaining strategies among adolescent boys.

1.9 Treatment possibilities of muscle dysmorphia

First of all, it should be noted that there is no empirically validated treatment for MD. However, because of the etiological similarities with eating disorders, it is hypothesized that those treatments that seem to be effective for eating disorders would be also effective for MD (Olivardia, 2007; Hungarian review: Babusa, 2011). Moreover, the treatments of obsessive-compulsive disorder and body dysmorphic disorder also provide a basis that may be helpful for the treatment of MD.

Another consideration is that men with MD rarely seek for treatment (Olivardia, 2007; Pope, Phillips, et al., 2000). If they do so, they do it because of secondary problems due to MD or substance abuse (e.g., depression, sexual dysfunctions, anxiety). When a person with MD engages in treatment, several therapeutical methods can be used.

1.9.1 Psychoeducation

As in the treatment of eating disorders, psychoeducation can be a necessary and relevant part of the treatment of MD. During the initial phase of the treatment, the assessment of the body image and the discussion about realistic body image ideals can be beneficial. Other topics for discussion may involve proper nutrition, the dangers of steroid use, and the onset and development of MD (Grieve et al., 2009; Olivardia, 2007).

1.9.2 Cognitive-behavioural therapy

Cognitive-behavioural techniques proved to be effective in the treatment for eating disorders and body dysmorphic disorder (Rosen, Reiter, & Orosan, 1995), suggesting that these therapeutical techniques could be useful in the treatment of MD (Olivardia, 2007). The purpose of cognitive strategies is to identify and modify distorted thinking patterns. For example, one typical distorted thinking pattern in MD is the “all or nothing

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thinking". During the therapy the patient is expected to observe and later on challenge these thoughts. The patient has to develop some coping skills to deal with maladaptive behaviours; therefore, relaxation techniques may be beneficial (Olivardia, 2007; Pope, Phillips, et al., 2000).

The aim of the behavioural strategies is the reduction of maladaptive behaviours, such as mirror checking, excessive exercise, and reassurance seeking. Social exposure may be also useful as a behavioural strategy. Other techniques, such as self-monitoring and identifying the triggers for the maladaptive behaviours also can be used. The therapy could also aim at stopping AAS use (Olivardia, 2007; Pope, Phillips, et al., 2000).

1.9.3 Psychodynamic psychotherapy

Exploring the potential causes of the development of MD in a safe and supportive environment can be helpful (Olivardia, 2007). Therefore, exploration of the development of masculinity, peer experiences, such as teasing and bullying experiences, relationship with the father, or important life events that may have contributed to the development of MD is advisable.

Relating to the psychodynamic therapy, we also have to consider the self-theoretical approach of MD (Babusa & Túry, 2007). In this respect the quality of the early mother-child realationship has an influence on the developing self –both on the body and the psychological self– of the child (Fonagy & Target, 1998). The damage of the early self is crucial in that respect how we can experience our body later in our lifes. Therefore, therapy should also focus on the disorders of the self and the inner object relations.

1.9.4 Pharmacotherapy

Those medications that help to decrease obsessive-compulsive symptoms of the disorder –and also effective in the treatment of eating disorders and body dysmorphic disorder– should be useful in the treatment of MD (Olivardia, 2007; Pope, Phillips, et al., 2000). Therefore, the use of selective serotonin reuptake inhibitors (SSRIs) during the treatment may be also beneficial.

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Many studies have suggested that MD is prominent among those men who are participating in sports; therefore, some authors emphasize the role of athletic trainers in the recognition of MD symptoms, as well as in the intervention strategy. Leone, Sedory, and Gray (2005) proposed a conceptual model for developing an intervention strategy to individuals with possible MD and suggested that this model can be an effective first step during the intervention (see Figure 5). They offer that athletic trainers should approach the individual with possible MD in a nonconfrontational manner and should focus on the motivation for the intervention.

Other authors highlighted the role of family members, close friends, and partners in the recognition of MD (Pope, Phillips, et al., 2000). The authors argued that many boys and men are ashamed about their muscularity and appearance concerns, and they often do not disclose them. They offered a list of twelve clues to the MD and some related body image disorders in boys and men (Pope, Phillips, et al., 2002, pp. 194–195).

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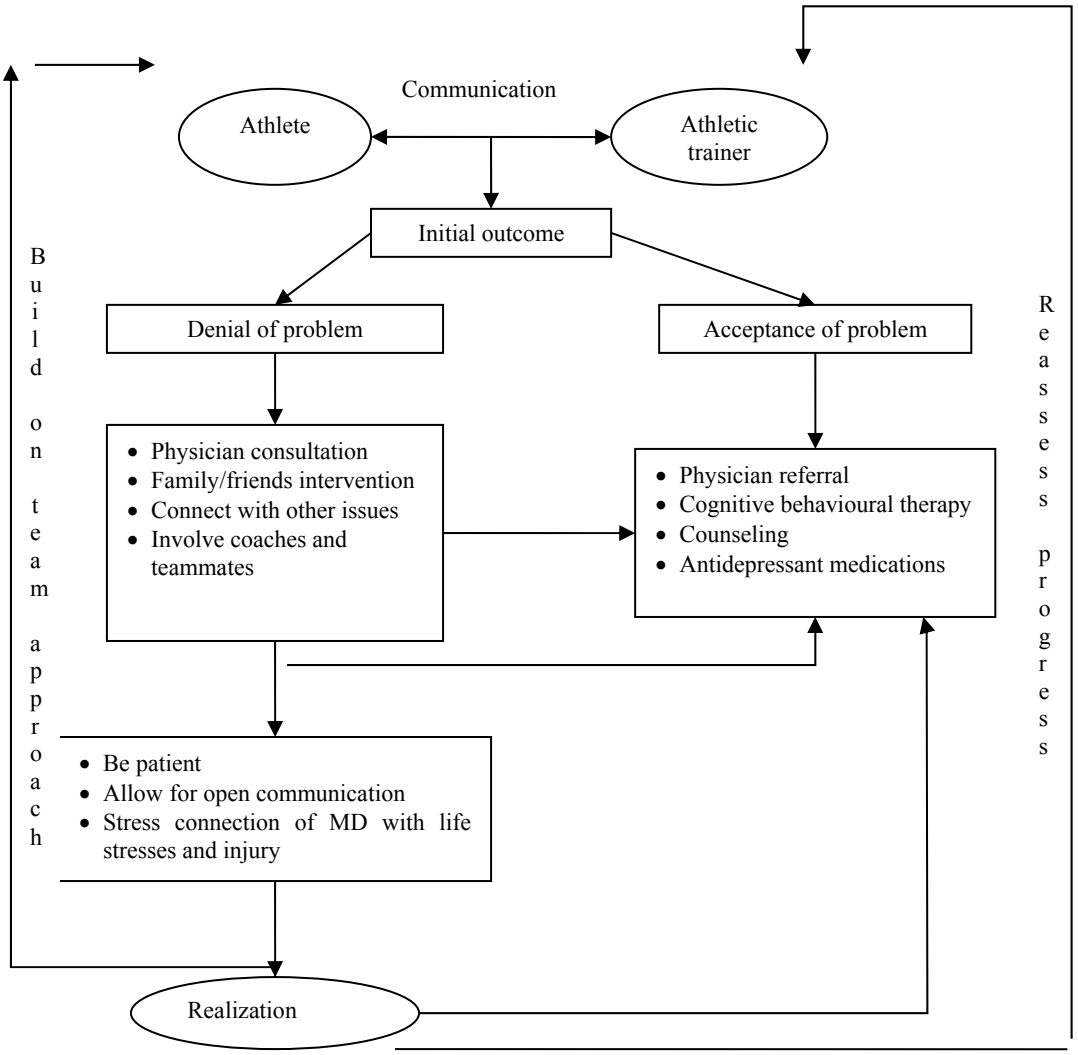

Figure 5. Conceptual model for developing an intervention strategy to individuals with possible muscle dysmorphia (Leone et al., 2005).

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2. OBJECTIVES

2.1 General objectives of the study

Currently, the epidemiology and prevalence rate of MD in Central-Eastern European countries, including Hungary, is unknown. The general objective of the study was the examination of MD symptomatology and related psychological correlates in Hungarian high risk populations. Moreover, the exploration of cultural differences in the manifestation of MD (i.e., prevalence rates, morbidity) is also an important field and may contribute to our understanding of this body image disorder.

The current work consisted of three different studies, and each of them targeted certain aims. The first preliminary study aimed to reveal MD among Hungarian male weightlifters and university students. Since there was no available measure of MD symptoms in Hungary, the study also examined the usability of the Hungarian version of the Muscle Appearance Satisfaction Scale (MASS; Mayville, Williamson, Netemeyer, & Drab, 2002), a measure of MD symptoms. The second study aimed to examine the psychometric properties of the Hungarian version of the MASS (MASS-HU) among male weightlifters and undergraduate students. The study analyzed the factor structure, the internal consistency, the test-retest reliability, and the construct validity of the MASS-HU. The first preliminary study and the second questionnaire validation study provided an appropriate framework for the epidemiological study of MD among male weightlifters (Study 3). The third study was a larger scale study, conducted among male weightlifters, with multiple aims: (1) to reveal the prevalence rate of MD among Hungarian male weightlifters, (2) to determine a tentative cut-off score of the MASS, (3) to examine the psychological correlates of MD, (4) to reveal the prevalence rate of AAS use among Hungarian male weightlifters, (5) to examine the characteristics and risk factors of AAS use. Since the third study was a broad spectrum study, we presented it in full details.

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2.2 Examination of muscle dysmorphia in male weightlifters and university students – aims

Since no validated measure for the assessment of MD symptoms was available in Hungary, the study aim was the preliminary investigation of the potential usability of the Muscle Appearance Satisfaction Scale (Mayville et al., 2002), a measure of MD symptoms, in Hungary. Therefore, this preliminary study explored MD symptoms in a Hungarian high risk population of male weightlifters as well as among university students. Specifically, eating disorder related psychopathological characteristics and body attitudes in these samples were studied.

2.3 Adaptation of the Muscle Appearance Satisfaction Scale in Hungary – aims and hypotheses

Research interest has grown considerably in recent years in the area of male body image disorders and specifically in MD. Research has also focused to study MD in the last decade in Hungary. Therefore, the importance of the validation of the MASS in Hungary has grown over the years. Furthermore, the validation of the MASS would make it possible to carry out cross-cultural comparative studies.

The main purpose of the second study was to examine the psychometric properties of the MASS among male weightlifters and undergraduate students in Hungary. Therefore, the factor structure, scale score reliability, test–retest reliability, construct, and discriminant validity of the MASS were investigated. The secondary aim was the the exploration of the relationship between aspects of MD, self-esteem, exercise-related, and other variables.

Hypothesis 1. Studies documented that the age of onset of MD was in early adulthood (19.17±4.38 years, Cafri et al., 2008; 19.4±3.6 years, Olivardia et al., 2000). It was expected that younger men would have higher scores on the MASS, and they would display more symptoms of MD.

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Hypothesis 2. Grieve (2007) involved body mass in the conceptual model of MD since increased body mass and the achievement of muscular and mesomorphic body shape are important for men with MD. Thus, men with higher BMI were predicted to report more symptoms of MD.

Hypothesis 3. The conceptual model of MD (Grieve, 2007) along with other studies (Grieve & Helmick, 2008; Lantz et al., 2001; Pope, Gruber, et al., 2000) identified low self-esteem as an etiological factor in MD. It was hypothesized that men with lower level of self-esteem were expected to display higher levels of MD.

Hypothesis 4. Studies suggested that men with MD showed increased desire for gaining muscle mass and drive for muscularity (Olivardia, 2001; Pope et al., 1997). Thus, an inverse relationship was hypothesized between drive for thinness and aspects of MD.

Hypothesis 5. MD is accompanied by excessive exercise and weightlifting activity (Pope et al., 1997). A positive correlation between MD symptoms and the years of exercise was assumed.

Hypothesis 6 and 7. There is a growing literature regarding the use of anabolic-androgenic steroids and food supplements among men suffering from MD, suggesting that these men are more likely to use these substances to increase muscle mass (Kanayama et al., 2006; Olivardia et al., 2000; Pope & Katz, 1994). Thus, it was hypothesized that current steroid users (H6) and food supplement users (H7) report more symptoms of MD.

Hypothesis 8. The conceptual model of MD (Grieve, 2007) also involves sport participation –mainly bodybuilding/weightlifting– as a risk factor. It was assumed that weightlifting activity indicates more MD symptoms in the undergraduates group.

2.4 Muscle dysmorphia among Hungarian male weightlifters – aims and hypotheses

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Since the third study was a larger scale study, it had multiple purposes. The first aim was to identify a group of male weightlifters with unique features of MD, which can be distinctive from "normal" non-muscle dysmorphic weightlifters. The secondary aim of the study was to explore differences between muscle dysmorphic and normal non-muscle dysmorphic groups of male weightlifters based on various psychological correlates. The third aim of the study was to define the tentative cut-off score of the MASS as there is no available cut-off score for the scale. The determination of a cut-point would allow the use of the MASS as a meaningful screening measure for the identification of those male weightlifters who are at-risk for developing MD. To our knowledge, only one study assessed the prevalence rate of AAS use in Hungarian male weightlifters (Túry et al., 2001). Since AAS use has many adverse effects and presumably has different risk factors like that of MD, we also aimed to set out the prevalence rate of AAS use among male weightlifters to examine the characteristics of AAS users, and to determine the risk factors associated with AAS use.

Hypothesis 1. Studies from the last twenty years reported considerable prevalence rate of MD among male weightlifters. Pope et al. (1993) found 8.3%, Pope and Katz (1994) reported 10%, and Hildenbrandt et al. (2006) identified 17% of their weightlifter sample as muscle dysmorphic with the use of latent class analysis. The previous smaller scale Hungarian study found 4% prevalence rate of MD among male weightlifters (Túry et al., 2001). It was assumed that the prevalence rate of MD among Hungarian male weightlifters in the current study is comparable with previously reported data.

Hypothesis 2. Growing body of literature suggests that men with MD use AAS and food supplements to increase their muscle mass more frequently than normal weightlifters (Cole, Smith, Halford, & Wagstaff, 2003; Kanayama et al., 2006; Olivardia et al., 2000; Pope & Katz, 1994). Therefore, it was hypothesized that the MD group report a higher frequency of AAS and supplement use.

Hypothesis 3. Several studies pointed out the relationship between low self-esteem and MD (Grieve, 2007; Grieve & Helmick, 2008; Lantz et al., 2001; Pope, Gruber, et al.,

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2000). It was hypothesized that MD group would have a lower level of self-esteem than normal weightlifters.

Hypothesis 4. Research pointed out that eating disorders are also prevalent among men with MD (Mangweth et al., 2001; McFarland & Kaminski, 2009; Pope et al., 1993; Pope et al., 1997; Olivarardia et al., 2000). It was assumed that MD group would display more eating disorder related psychopathological characteristics than normal weightlifters.

Hypothesis 5. Many studies found an association between MD and anxiety disorders (Chandler & Grieve, 2009; Maida & Armstrong; 2005; McFarland & Kaminski, 2009; Olivardia et al., 2000; Cafri et al., 2008), thus it was hypothesized that MD group would have a higher level of anxiety compared to normal weightlifters.

Hypothesis 6. Research showed that the prevalence of AAS use is considerably high in the bodybuilder and weightlifter population (Thiblin & Petersson, 2005). Pope et al. (1993) and Kanayama et al. (2003) reported 51% and 50%, respectively. Pope et al. (2012) found 44% prevalence rate of AAS use among male weightlifters. Previous Hungarian smaller scale study found 9.3% prevalence rate of AAS use among male weightlifters (Túry et al, 2001). It is assumed that the prevalence rate of AAS use among Hungarian male weightlifters in the current study will be comparable with previously reported data.

Hypothesis 7. Research evidence suggests that AAS users display higher levels of MD symptoms than non-users (Kanayama et al., 2003; Rohman, 2009; Olivardia et al., 2000; Pope et al., 1993). Therefore, higher levels of MD symptoms were assumed among AAS user male weightlifters.

Further, we aimed to explore those psychological characteristics (self-esteem, self-efficacy, trait anxiety, and eating disorder related psychopathological characteristics) which may be associated with the use of AAS.

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3. METHODS

3.1. Study design and sample

3.1.1 Examination of muscle dysmorphia in male weightlifters and university students

Two independent samples were recruited for this study:
Sample 1: Participants in this group were male weightlifters (n = 60) recruited in fitness centers and gyms.

Sample 2: Participants were age-matched undergraduate male students (n = 60), reporting no weightlifting activity.

All participants provided written informed consent, took part in the study on a voluntary basis and were not remunerated for participation. Participants were asked to complete the paper-and-pencil questionnaire anonymously, which took approximately 10 minutes.

3.1.2 Adaptation of the Muscle Appearance Satisfaction Scale in Hungary

Three independent samples were recruited for the questionnaire based study:

In Sample 1, male weightlifters (n = 289) participating in weightlifting activity were recruited in fitness centers and gyms located in Budapest and its outskirts. The only exclusion criterion was age below 18. They were invited to complete the online questionnaire anonymously, which took approximately 15-20 min. Invitations to take part in an exercise-related study, called “Exercise and Quality of Life”, were given either personally or sent by the owners of several gyms and fitness clubs via email. The invitation letter contained general information about the study, the address of the website of the online questionnaire, and the username and password for the entrance.

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The website presented an introductory letter that contained the elements of the informed consent. Participants were asked to confirm their agreement in the study, by clicking on a button, acknowledging that they have read the informed consent and were comfortable with that. After the completion of the questionnaire, participants submitted their responses, which were downloaded in an excel spreadsheet. The responses were then imported in SPSS for data analysis.

In Sample 2, male undergraduate students (n = 240) were asked to complete the paper-and-pencil questionnaire anonymously during or after a university class in a large university located in Budapest.

An additional sample (Sample 3) of male weightlifters (n = 43) were recruited in gyms in order to assess the test–retest reliability of the MASS. Participants were asked to write a code on their questionnaire. This code allowed the researchers to perform a two-week follow-up.

3.1.3 Muscle dysmorphia among Hungarian male weightlifters

The sample size of the second study was complemented by 15 new participants, thus the total sample size of the third study was 304 male weightlifters.

3.1.4 Ethical approval

Ethical approval for the studies was obtained from the Semmelweis University Regional and Institutional Committee of Science and Research Ethics (3/2009). All participants provided informed consent. They were not remunerated for participation and taking part in the study was voluntary.

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3.2. Measuring instruments

3.2.1 Examination of muscle dysmorphia in male weightlifters and university students

3.2.1.1 Muscle Appearance Satisfaction Scale

Muscle Appearance Satisfaction Scale (MASS; Mayville et al., 2002; Hungarian version: Babusa & Túry, 2011; Hungarian validation: Babusa, Urbán, Czeglédi, & Túry, 2012) is a short, 19-item scale developed to measure cognitive, affective, and behavioral dimensions of MD and it's symptoms. The multidimensional self-report measure has five subscales:

(1) *Bodybuilding Dependence*: this subscale reflects an excessive weightlifting activity and also a compulsive tendency to work outs. The subscale includes such statements as "If my schedule forces me to miss a day of working out with weights, I feel very upset".

(2) *Muscle Checking*: items in this subscale reflect mirror checking and reassurance seeking behavior to assess the appearance of one's muscles. The subscale includes such statements as "I often spend a lot of time looking at my muscles in the mirror".

(3) *Substance Use*: this subscale evaluates a willingness to try anabolic-androgenic steroids and other potentially risky supplements to gain muscle mass. The subscale includes such statements as "I often spend money on muscle building supplements".

(4) *Injury Risk*: items in this subscale assess the symptoms of overtraining and beliefs related to unsafe weightlifting behaviour. The subscale includes such statements as "I often keep working out even when my muscles or joints are sore from previous workouts".

(5) *Muscle Satisfaction*: this subscale evaluates the satisfaction with the individual's own muscle size and shape. The subscale includes such statements as "When I look at my muscles in the mirror, I often feel satisfied with my current muscle size".

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The scale contains both positive- and reverse-worded items. The items were rated on a five-point Likert-type scale (1 = strongly disagree, 5 = strongly agree). Scores ranged from 19 to 95 with higher scores reflecting a tendency towards MD. Examination of the internal consistency of the MASS has proved that the scale total score had good reliability (α = .87 and .82; Mayville et al., 2002) and test-retest reliability (*r* = .87, Mayville et al., 2002). All in all, the evaluation of psychometric properties of the MASS supported its internal consistency, test-retest reliability, construct validity, and a stable five-factor structure in samples of male weightlifters. Alpha coefficients in the current study samples were .85 (95% CI [.79, .90]) for weightlifters and .81 (95% CI [.74, .87]) for undergraduates.

It has to be mentioned that there was no available measure assessing MD symptoms in Hungarian language before this study. Therefore, previous research studying MD used neither the MASS, nor other MD-related measures in Hungary. During the construction of the Hungarian version of the MASS, we focused on achieving conceptual equivalence. Thus, we applied the forward-backward-forward translation technique. In the first step, two independent professional bilingual translators translated the original English version of the MASS into Hungarian. Then, the two independent professional bilingual translators and one member of the research group reviewed and reconciled the forward translation. After that, the reconciled forward translation was translated back into English by another two independent bilingual translators. In the second step, the research group and the professional forward translators reviewed and compared the backward translation with the original English questionnaire. The back-translated questionnaire was similar in meaning to the original English questionnaire. The aim of the final step was to reconcile the items of the MASS and produce the final forward translation.

3.2.1.2 Body Attitude Test

Body Attitude Test (BAT; Probst, Vandereycken, Van Coppenolle, et al. 1995; Hungarian version: Túry & Szabó, 2000) is a 20-item self-report instrument developed to measure attitudes towards body image. The scale has four dimensional factors: (1) Negative Appreciation of Body Size, (2) Lack of Familiarity with one's own Body, (3)

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General Body Dissatisfaction, and (4) a rest factor. Items were rated on a 6-point Likert-type scale (0 = never, 5 = always). The scale contains both positive and reverse-worded items. Scores ranged from 0 to 100, higher score indicates deviated body experience. The cut-off score is 36 for pathological body attitude. Previous work on different Hungarian samples has shown that the scale has good reliability (α = .89-90, test-retest: *r* = .92) construct and convergent validity (Czeglédi, Urbán, & Csizmadia, 2010). Alpha coefficients in the current study samples were .77 (95% CI [.68, .85]) for weightlifters and .82 (95% CI [.75, .88]) for undergraduates.

3.2.1.3 Eating Disorders Inventory

Eating Disorder Inventory (EDI; Garner et al., 1983; Hungarian version: Túry, Sáfrán, Wildmann, & László, 1997) is a 64-item scale developed to measure behavioural and psychological traits in AN and BN in eight subscales:

(1) Drive for Thinness subscale measures excessive concern with body weight and an intense drive for a thin body.
(2) Bulimia subscale indicates binge eating episodes and self-induced vomiting.
(3) Body Dissatisfaction measures the belief that some body parts are too large or fatty.
(4) Ineffectiveness subscale reflects to the lack of general self-efficacy and the feeling of inadequacy.
(5) Perfectionism subscale assesses the increased desire towards high personal achievements.
(6) Interpersonal Distrust subscale reflects the feeling of alienation and fear of too close relationships.
(7) Interoceptive Awareness assesses the "lack of confidence in recognizing and accurately identifying emotions and sensations of hunger or satiety" (Garner et al., 1983).
(8) Maturity Fears measures the fears of the demands of adulthood and the general positive feelings relating to the security of the childhood.

The subscales contain both positive- and reverse-worded items. Items were rated on a 6-point Likert-type scale (1 = never, 6 = always). In the present study, four subscales

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assessing the psychological characteristics of individuals with eating disorders (Ineffectiveness, Perfectionism, Interpersonal Distrust, and Interoceptive Awareness) and one subscale measuring the attitudes towards body shape (Body Dissatisfaction) were used. Higher scores on the subscales indicate higher levels of eating disorder related pychopathological characteristics. In a previous study conducted on a Hungarian sample, the subscales demonstrated adequate reliability (α = .71–.93; test-retest: *r* = .79) and construct validity (Túry et al., 1997). Alpha coefficients in the current study samples were acceptable for weightlifters (α = .61–.79) and ranged from poor to acceptable for undergraduates (α = .59–.74).

3.2.2 Adaptation of the Muscle Appearance Satisfaction Scale in Hungary

3.2.2.1 Sociodemographic and anthropometric data

Six questions were devised to reveal the sociodemographic (age, marital status, place of usual residence, educational qualifications) and anthropometric data (body height and body weight) of the participants.

3.2.2.2 Exercise-related variables

Besides the demographic and anthropometric questions we also targeted some exercise-related variables. These questions consisted of: (1) years of exercise (i.e., "How long do you have been lifting weights?"), (2) current use of anabolic-androgenic steroids and (3) food supplements in yes/no response format question (i.e., "Do you currently use anabolic androgenic steroids?" and "Do you currently use food supplements?") in the weightlifter group, and (4) any weightlifting activity in yes/no-response format question (i.e., "Are you engaged in any weightlifting activity?") in the undergraduates group.

3.2.2.3. Muscle Appearance Satisfaction Scale

The general description of the Muscle Muscle Appearance Satisfaction Scale (MASS; Mayville et al., 2002) has been detailed in Study 1. Alpha coefficients in the current study samples are presented in Tables 7 and 8.

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3.2.2.4 Eating Disorders Inventory – Drive for thinness subscale

The Eating Disorder Inventory (EDI; Garner et al., 1983) has been described in details in Study 1. In the present study, only the seven-item Drive for Thinness subscale of the inventory was used, which assesses attitudes towards weight, body shape, and eating, i.e., preoccupation with diet, concern over body weight, drive for losing weight, and fear of gaining weight. Scores ranged from 0 to 21 (scoring procedure see: Garner et al., 1983), with higher scores reflecting a greater drive for thinness. Alpha coefficients in the current study samples for the Drive for Thinness subscale were .70 (95% CI [.64, .75]) for weightlifters and .73 (95% CI [.67, .78]) for undergraduates.

3.2.2.5 Rosenberg Self-Esteem Scale

Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965; Hungarian version: Paksi, Felvinczi, & Schmidt, 2004) is a 10-item scale for the measurement of global self-esteem understood as a person's overall evaluation of his or her worthiness as a human being. Items were rated on a Likert-type scale (1 = strongly disagree, 4 = strongly agree). The scale contains both positive and reverse-worded items. Scores range from 10 to 40, with higher scores reflecting higher self-esteem. Previous studies on the Hungarian version of RSES demonstrated adequate internal consistency (α = .77; Paksi et al., 2004; α = .79 and .85; Czeglédi et al., 2010). Alpha coefficients in the current study samples were .82 (95% CI [.78, .85]) for weightlifters and .86 (95% CI [.83, .88]) for undergraduates.

3.2.3 Muscle dysmorphia among Hungarian male weightlifters

3.2.3.1 Sociodemographic and anthropometric data

Seven questions were devised to reveal the sociodemographic (age, marital status, place of usual residence, educational qualifications) and anthropometric data (body height, body weight, and desired body weight) of the participants.

3.2.3.2 Exercise-related variables

Besides the demographic and anthropometric questions we also targeted some exercise-related variables. These questions consisted of:

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(1) years of exercise (i.e., "For how long have you been lifting weights?"),
(2) the amount of time spent with exercise (i.e., "How long is your regular exercise?"),
(3) current use of anabolic-androgenic steroids in yes/no response format (i.e., "Do you currently use anabolic-androgenic steroids?"),
(4) past use of anabolic-androgenic steroids in yes/no response format (i.e., "Have you used anabolic-androgenic steroids in the past?"),
(5) use of food supplements in yes/no response format (i.e., "Do you currently use food supplements?").

3.2.3.3 Training objectives and subjective satisfaction

A short, four-item questionnaire concerning the subjective satisfaction with body weight and musculature and the subjective importance of weight loss and muscle mass gain as training objectives was constructed for the purpose of this study. The purpose of this scale was the assessment of general importance of weight loss and muscle mass gain as training objectives, as well as subjective satisfaction with body weight and musculature at the present time. Items were rated on a 5-point Likert-type scale (1 = not important/satisfied at all, 5 = very important/satisfied), with higher scores reflecting higher importance or satisfaction.

3.2.3.4 Weight dissatisfaction

Weight dissatisfaction was counted as the desired body weight minus the actual body weight (self-reported). This parameter indicates how far or close a person is from the weight that he would like to have. With the use of the weight dissatisfaction parameter we were also able to define the direction of the weight dissatisfaction; thus, a positive sign indicated the desire of weight loss and a negative sign indicated the desire of weight gain. Both positive and negative signs indicate weight dissatisfaction, while value zero suggests weight satisfaction, since there is no difference between actual and desired body weight. On the basis of this continuous variable we created a further discrete variable –body weight category: (1) would like to lose weight, (2) would like to remain in the current weight, (3) would like to gain weight.

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3.2.3.5 Muscle Appearance Satisfaction Scale

The general introduction of the Muscle Appearance Satisfaction Scale (Mayville et al., 2002) has been described in Study 1. The examination of the psychometric properties of the Hungarian version of the MASS (MASS-HU) supported the use of the construct in male weightlifter population. Alpha coefficients in the current study sample ranged from acceptable to good, and are presented in Table 13.

3.2.3.6 Eating Disorders Inventory

The general description of the Eating Disorders Inventory (EDI; Garner et al., 1983) has been detailed in Study 1. In the present study two subscales that assessed the attitudes towards weight, body shape, and eating (i.e., Drive for Thinness and Bulimia) and three subscales that assessed the psychological characteristics of individuals with eating disorders (i.e., Perfectionism, Interoceptive Awareness, and Interpersonal Distrust) were used. Higher scores on the subscales indicate higher levels of eating disorder related pychopathological characteristics. Alpha coefficients in the current study were acceptable, and are presented in Table 13. The Bulimia subscale of the EDI had unacceptable internal consistency (α = .40, 95% CI [.29, .50]); thus this measure had to be excluded from the analysis due to low Cronbach's alpha value (< .6).

3.2.3.7 SCOFF Questionnaire

The SCOFF Questionnaire (Morgan, Reid, & Lacey, 1999; Hungarian translation: Túry F.) is a brief screening tool using five questions addressing core features of AN and BN. The measure consists of five items in yes/no response format question. Two or more “yes” answers to the questions are recommended as the cut-off to indicate a likely case of AN or BN. The authors recommended the use of SCOFF as a screening tool that can raise the suspicion of a likely case of eating disorder rather than to use it as a diagnostic tool.

Alpha coefficient is presented in Table 13. Further methodological considerations relating to the scale are discussed in the Limitations section.

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3.2.3.8 Exercise Addiction Inventory

The Exercise Addiction Inventory (EAI; Terry et al., 2004; Hungarian version: Demetrovics & Kurimay, 2008) is a short, six-item scale developed to measure exercise addiction. Items were rated on a 5-point Likert-type scale (1 = strongly disagree, 5 = strongly agree). Scores range from 6 to 30, with higher scores reflecting attributes of addictive exercise behavior. The items have been developed to reflect the main characteristics of exercise addiction, such as perceived importance of exercise, subjective experience reported as a consequence of exercise, frequency of exercise needed to achieve the desired benefits, presence of withdrawal symptoms, perceived conflicts between the sufferer and family arising from the exercising, and possible occurrences of relapse.

The authors of the EAI also provided a theoretical and convenient cut-off score for the identification of those who are at risk for exercise addiction, and can distinguish between those who may be symptomatic or asymptomatic of exercise addiction. The cut-off score for individuals considered at-risk of exercise addiction was 24. This cut-off point represents those individuals with scores in the top 15% of the total scale score. A score of 13–23 was indicative of a symptomatic individual and a score of 6–12 indicated an asymptomatic individual. A recent Hungarian study demonstrated that the EAI has good psychometric properties and also suggested new thresholds for the EAI: 0–13 = asymptomatic, 14–23 = symptomatic non-dependent, 24–30 = at risk for exercise dependence (Mónok et al., 2012).

Previous works on Hungarian samples demonstrated adequate internal consistency for the scale (α = .72; Mónok et al., 2012; Paksi, Rózsa, Kun, Arnold, & Demetrovics, 2009). Alpha coefficient in the current study sample is presented in Table 13.

3.2.3.9 State-Trait Anxiety Inventory – Trait Anxiety subscale

The State-Trait Anxiety Inventory (STAI; Spielberger, Gorssuch, Lushene, Vagg, & Jacobs, 1983; Hungarian version: Sipos, Sipos, & Spielberger, 1988) is used to assess state and trait-based levels of anxiety. The STAI is a 40-item self report measure that assesses both how a person feels at the moment (state anxiety) and how he or she

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generally feels (trait anxiety). Because the focus of this study is on the overall personality and long-term characteristics of the participants, we assessed only the trait anxiety in the current study. The Trait Anxiety subscale is a 20-item measure that contains both positive and reverse-worded items. The items were rated on a four-point Likert-type scale (1 = not at all, 4 = very much so). Scores range from 20 to 80; higher scores indicate greater trait anxiety. Previous studies on the Hungarian version of the STAI demonstrated adequate reliability (α = .86; Sipos, 1978). In the present study, the Cronbach's alpha for the STAI was good and is presented in Table 13.

3.2.3.10 Rosenberg Self-Esteem Scale

The general description of the Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965) has been detailed in Study 2. Alpha coefficient in the current study sample was good and is reported in Table 13.

3.2.3.11 General Self-Efficacy Scale

The General Self-Efficacy Scale (GSES; Schwarzer & Jerusalem, 1995; Hungarian version: Kopp, Schwarzer, & Jerusalem, 1993) is a ten-item measure that has been designed to assess optimistic self-beliefs to cope with a variety of difficult demands in life. The GSES in general refers to the sense of personal competence to deal effectively with a variety of stressful situations; in other words, it reflects the belief that one's actions are responsible for successful outcomes. These items were rated on a four-point Likert-type scale (1 = not at all true, 4 = exactly true). Scores range from 10 to 40, with higher scores reflecting higher perceived self-efficacy. Previous studies on the Hungarian version of the GSES demonstrated adequate reliability (α = .82; Salavecz, Neculai, & Jakab, 2006; α = .83; Rózsa et al., 2003). Alpha coefficient in the current study sample was good and is reported in Table 13.

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3.3. Data analyses

3.3.1 Examination of muscle dysmorphia in male weightlifters and university students

3.3.1.1 Analyses of the examination of muscle dysmorphia symptoms, eating disorder variables, and body attitudes

To explore the differences of MD symptoms, eating disorder related psychopathological characteristics, and body attitudes between weightlifters and undergraduates, a series of independent sample *t*-tests and Mann-Whitney U-tests were performed. Effect size was calculated using Cohen's *d.* An effect size of more than .2 was considered to be a small effect size. An effect size of .5 or more signified a medium-size effect, and an effect size of .8 or more indicated a large effect size (Cohen, 1992). Group differences were explored using multiple linear regression analysis adjusted to age and BMI.

3.3.1.2 Analyses to explore the explanatory variables of muscle dysmorphia

To investigate explanatory variables that are associated with MD among male weightlifters, multiple linear regression analyses were performed, adjusted to age and the strength and direction of relationships between the dependent variable (levels of MD symptoms based on the MASS scores). Furthermore, explanatory variables (group participation –weightlifter or undergraduate–, body weight, desired body weight, EDI subscales: body dissatisfaction, ineffectiveness, perfectionism, interpersonal distrust, interoceptive awareness, maturity fears; body attitudes, and age) were assessed by determining regression coefficients (adjusted β), and *t*-test statistics. The proportion of the variance in the dependent variable explained by the explanatory variables (adjusted R^2) has also been determined.

3.3.1.3 Analyses of the study variables in self-reported steroid users and non-users

Comparing the self-reported steroid users and non-users in the weightlifter group, a series of independent sample *t*-tests and Mann-Whitney U-tests were performed and the

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means (*SD*) of the different study variables were compared. Effect size was calculated using Cohen's *d*. Group differences were explored using multiple linear regression analysis adjusted to age and BMI. The SPSS 16.0 statistical software package was used for statistical analyses.

3.3.2 Adaptation of the Muscle Appearance Satisfaction Scale in Hungary

3.3.2.1 Analyses of the factorial structure of the Hungarian version of the Muscle Appearance Satisfaction Scale

We examined the factorial structure of the Hungarian version of the MASS with exploratory factor analysis (EFA) with MPLUS 6.0. Based on the fact that the distribution of answers to the items showed considerable floor or ceiling effects, we treated the answers as an ordinal scale, and the robust weighted least squares estimation was used in EFA (Brown, 2006). We applied GEOMIN rotation in EFA, which is an oblique type of rotation; therefore correlations between factors are allowed (Browne, 2001). In the EFA, goodness of fit is characterized by the root-mean-square error of approximation (RMSEA), its 90% confidence interval (90% CI) and its closeness of fit. Closeness of model fit using RMSEA (CFit of RMSEA) is a statistical test (Browne & Cudek, 1993), which evaluates the statistical deviation of RMSEA from the value .05. Nonsignificant probability values ($p > .05$) indicate acceptable model fit. The further fit index reported in this study is comparative fit index (CFI) which is expected to be above .95.

3.3.2.2 Analyses of the reliability of the Muscle Appearance Satisfaction Scale

The scale score reliability for the MASS total score and subscale scores were calculated using Cronbach's alpha coefficient. To examine the test-retest reliability, intraclass correlation is sometimes required; however, some authors argue for the use the product-moment correlation, if we do not want to take systematic error into account (Rousson, Gasser, & Seifert, 2002). In our analysis, we reported the intraclass correlations based on a two-way random model, and we also reported Pearson's correlations in order to be comparable with previous studies.

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3.3.2.3 Analyses of the construct validity of the Muscle Appearance Satisfaction Scale

To test the construct validity multivariate regression analyses were estimated with the MASS subscales as observed outcome variables in both groups. The MASS subscales' scores were calculated with the sum of the items belonging to one factor for the sake of the comparability with previous and following studies. In the weightlifter sample the model was estimated with the factors of the MASS as observed variables, and age, body mass index, self-esteem, drive for thinness, current use of steroids, and current use of food supplements as explanatory variables. This model is presented in Figure 6.

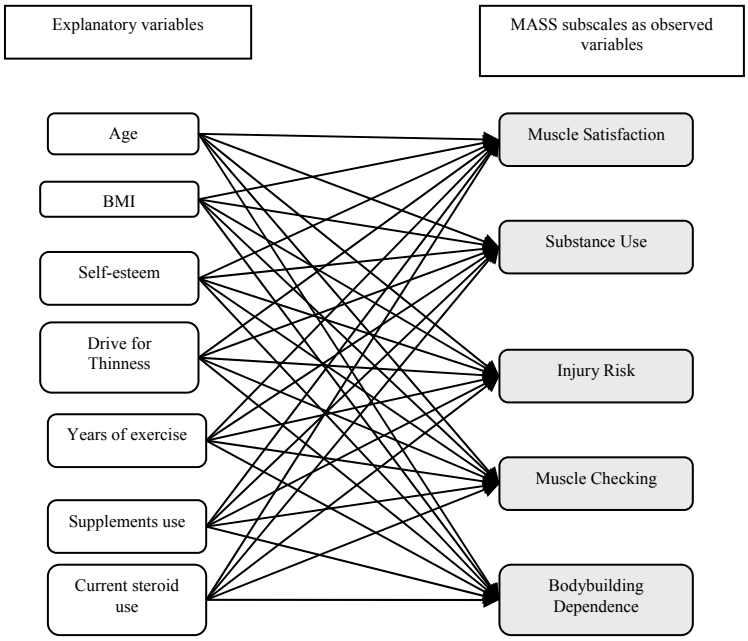

Figure 6. Multivariate model to explain Muscle Appearance Satisfaction Scale subscales in the weightlifter sample.
In this fully saturated model, the error covariances of Muscle Appearance Satisfaction Scale subscales are not presented for the sake of clarity.

Similarly to the previous model, in the undergraduate sample the model was estimated with the factors of the MASS identified in this group as observed variables, and age, body mass index, self-esteem, drive for thinness, and weightlifting activity as explanatory variables. The above models were saturated models, therefore the level of fit was not estimated due to the perfect fit. The SPSS 16.0 and MPLUS 6.0 statistical software packages were used for statistical analyses.

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3.3.3 Muscle dysmorphia among Hungarian male weightlifters

3.3.3.1 Analyses to explore the prevalence of muscle dysmorphia

To set out the estimated prevalence rate of MD and in order to identify a group of weightlifters with the common features of MD, latent class analysis (LCA) was conducted, by which a homogenous group –a subgroup of males with MD– can be distinguished within a heterogeneous group (male weightlifters). LCA is a statistical method for identifying unmeasured class membership among subjects using categorical and/or continuous observed variables. Therefore, LCA creates subgroups on the basis of previously defined variables, by which the associations between the groups can be reduced. Several studies have used LCA to find distinct diagnostic categories given the presence/absence of several symptoms or types of attitudes (e.g., Demetrovics et al., 2012; Fink et al., 2004; Keel et al., 2004). Moreover, a recent study also used LCA to reveal a MD group within male weightlifters (Hildebrandt, Schlundt, Langenbucher, & Chung, 2006). Ten variables were involved in the analysis: (1–5) five subscales of the MASS, (6) Exercise Addiction Inventory, (7) quantity time X frequency of exercise as continuous variable, and (8) supplement use, (9) current AAS use, (10) lifetime AAS use as categorical variables (see Table 14). Variable 7 (QF of exercise) indicates quantity-frequency of exercise, that had been calculated the amount of time in hours spent weightlifting per day multiplied by the number of days spent with work out per week (Hildebrandt, Langenbucher, & Schlundt, 2004; Hildenbrandt et al., 2006). The variables that have been involved in the LCA are associated with the criteria for MD (Pope et al., 1997). Latent class analysis was performed with 2 to 4 classes with the full sample (n = 304) with MPLUS. The LCA (Collins & Lanza, 2010; Vermunt & Magidson, 2002) is a latent variable analysis with a dichotomous latent variable –i.e., men with MD– and continuous indicators such as scores of MASS and also with categorical indicators such as AAS use. To determine the number of latent classes and the relative goodness of fit of the models, the Bayesian Information Criteria (BIC) parsimony index was used, with the minimization of cross-classification probabilities, entropy and the interpretability of clusters. Lower BIC value indicates a better-fitting model, and higher entropy value indicates better classification quality. Furthermore, the

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likelihood-ratio difference test (Lo-Mendell-Rubin Adjusted LRT Test) was also used during the final determination of the number of latent classes, which compares the estimated model with a model having one less class than the estimated model (Muthén & Muthén, 1998). A low *p* value (< .05) indicates that the estimated model is fitting better than the model with one less class.

3.3.3.2 Analyses to determine the cut-off score for the MASS

To define the tentative cut-off score of the MASS a sensitivity analysis was carried out. As there is no existing 'gold standard' available for the measurement of MD symptoms in Hungary, a sensitivity analysis based on the membership in the MD group in the latent class analysis was conducted. Thus, considering the MD group as a gold standard, sensitivity and specificity values were calculated for several MASS cut-off points. The accuracy of the MASS can be assessed by calculating the proportion of cases who are classified as belonging in the MD group versus the non-MD cases. Sensitivity (i.e., the proportion of true positives that are correctly identified by the MASS) and specificity (i.e., the proportion of true negatives that are correctly identified by the MASS) were defined according to the suggestion of Altman and Bland (1994a) and Glaros and Kline (1988). To explore the probability that the MASS will give the correct "diagnosis", the positive predictive values, the negative predictive values, and the accuracy values were calculated for several MASS cut-off points. Positive predictive value (PPV) was defined as the proportion of individuals with positive test results who were correctly diagnosed (Altman & Bland, 1994b; Glaros & Kline, 1988). Negative predictive value (NPV) was defined as the proportion of participants with negative test results who were correctly diagnosed (Altman & Bland, 1994b; Glaros & Kline, 1988).

3.3.3.2 Analyses to assess the psychological correlates of muscle dysmorphia

Comparisons of the three groups resulted from the LCA (i.e., normal weightlifters, low risk MD group, and high risk MD group) with respect to continuous variables were performed by one way analysis of variance (ANOVA; *F*-value), followed by post-hoc Tukey-Kramer pairwise comparison of means. If homogeneity of variance was violated, robust Welch ANOVA (*W*-value) was applied, followed by post-hoc Games-Howell pairwise comparison of means. In case of non-normally distributed variables and

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homogeneity of variance, Kruskal-Wallis test (*H*-value) was conducted. If the homogeneity of variance was violated, adjusted rank Welch test (*rW*3-value) was applied. Tests of pairwise stochastic equalities was used as post-hoc test.

3.3.3.3 Analysis to assess the characteristics of anabolic-androgenic steroid users

For the comparison of psychological correlates of steroid non-users, past- and current steroid users, one-way analysis of variance (ANOVA; *F*-value) was used, followed by post-hoc Tukey-Kramer pairwise comparison of means. If homogeneity of variance was violated, Robust Welch ANOVA (*W*-value) was applied, followed by post-hoc Games-Howell pairwise comparison of means. In case of non-normally distributed variables Kruskal-Wallis test (*H*-value) or adjusted rank Welch test (*rW*3-value) were applied, followed by post-hoc tests of pairwise stochastic equalities.

3.3.3.4 Analysis to explore the risk factors of lifetime AAS use

To investigate the predictors of lifetime AAS use among male weightlifters, binary logistic regression analysis was performed adjusted to age and level of education. The SPSS 16.0, MPLUS 6.0, and ROPstat statistical software packages were used for statistical analyses.

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4. RESULTS

4.1 Examination of muscle dysmorphia in male weightlifters and university students

4.1.1 Characteristics of the samples

Table 2 presents the descriptive statistics and comparison of weightlifter and undergraduate groups in terms of anthropometric data. The mean body height of the participants in the male weightlifter and in the undergraduate samples did not differ significantly, $t_{(118)} = 0.115$, $p = .909$, Cohen's $d = 0.02$. The participants of the weightlifter group reported the desire to gain some weight, whereas those in the undergraduate group reported the intention to lose some. The body weight, BMI, and desired body weight of the male weightlifters were significantly higher compared to the undergraduates. The mean body weight of the weightlifters was 88.5 kg ($SD = 14.73$) and their desired body weight was 93.6 kg ($SD = 15.56$). Undergraduates reported a mean body weight of 80.0 kg ($SD = 12.47$) and desired body weight of 78.7 kg ($SD = 9.45$), which were significantly lower comparing to the weightlifters, $t_{(118)} = 3.430$, $p < .001$, Cohen's $d = 0.63$ and $W_{(118)} = 6.351$, $p < .001$, Cohen's $d = 1.16$, respectively. Conversely, the mean BMI ($M = 27.0$, $SD = 3.09$) and the desired BMI ($M = 28.6$, $SD = 4.29$) of the weightlifters were significantly higher compared to the undergraduates, $t_{(118)} = 3.899$, $p < .001$, Cohen's $d = 0.71$ and $Z = 6.700$, $p < .001$, Cohen's $d = 1.32$, respectively. Participants in the weightlifter group lifted weights at a mean of four times per week.

Table 2
Anthropometric data of weightlifters and undergraduates

	Weightlifter group (n = 60)	**Undergraduate group (n = 60)**	**Test statistic**	**Cohen's *d***
	M (SD)	***M (SD)***		
Age (years)	27.7 (7.53)	27.8 (7.45)	$Z = 0.061$	–0.01
Body height (cm)	180.6 (7.23)	180.5 (8.62)	$t_{(118)} = 0.115$	0.02
Body weight (kg)	88.5 (14.73)	80.0 (12.47)	$t_{(118)} = 3.430$***	0.63
Desired body weight (kg)	93.6 (15.56)	78.7 (9.45)	$W_{(118)} = 6.351$***	1.16
Body Mass Index	27.0 (3.9)	24.5 (3.2)	$t_{(118)} = 3.899$***	0.71
Desired Body Mass index	28.6 (4.29)	24.1 (2.23)	$Z = 6.700$***	1.32

Note. * $p < .05$. ** $p < .01$. *** $p < .001$.

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4.1.2 Examination of study variables in male weightlifters and university students

Table 3 presents the comparison of the study variables of the weightlifter and undergraduate groups. The weightlifter group had significantly higher scores on the Ineffectiveness, $Z = 3.124$, $p < .01$, Cohen's $d = 0.60$, Perfectionism, $W_{(109)} = 3.432$, $p < .001$, Cohen's $d = 0.63$, and Interpersonal Distrust, $Z = 2.508$, $p < .05$, Cohen's $d = 0.47$ subscales of the EDI. Furthermore, participants in the weightlifter group also scored significantly higher on the Body Attitude Test, $t_{(118)} = 2.234$, $p < .05$, Cohen's $d = 0.41$. For the examination of the MD symptoms, MASS total score and subscale scores were investigated in both study samples. The weightlifter group scored significantly higher on the MASS total scale, $W_{(96)} = 7.407$, $p < .001$, Cohen's $d = 1.35$, the Bodybuilding Dependence, $Z = 7.351$, $p < .001$, Cohen's $d = 1.55$, the Muscle Checking, $Z = 7.351$, $p < .001$, Cohen's $d = 0.80$, the Substance Use, $Z = 6.762$, $p < .001$, Cohen's $d = 1.27$, and the Injury Risk, $W_{(107)} = 4.790$, $p < .001$, Cohen's $d = 0.88$, subscales of the MASS. The Muscle Satisfaction subscale of the MASS did not indicate a significant group difference, $W_{(114)} = 0.246$, $p = .806$, Cohen's $d = –0.05$.

To identify group differences between weightlifters and university student, multiple linear regression analysis was performed. The variables which proved to be significant during the comparison of groups were used in the analysis, adjusted to age and BMI. According to the results, the Ineffectiveness, $\beta = –.27$, $p = .005$, the Perfectionism, $\beta = –.30$, $p = .001$, and the Interpersonal Distrust, $\beta = –.20$, $p = .038$, subscales of the EDI, and the Bodybuilding Dependence, $\beta = –.59$, $p < .001$, the Muscle Checking, $\beta = –.34$, $p < .001$, the Substance Use, $\beta = –.49$, $p < .001$, and the Injury Risk, $\beta = –.34$, $p < .001$, subscales of the MASS and the MASS total, $\beta = –.52$, $p < .001$, indicated significant group differences. In respect to Body Attitude we did not find significant group difference, $\beta = –.05$, $p = .571$.

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Table 3

Study variables of weightlifters and undergraduates

	Weightlifter group (*n* = 60)	**Undergraduate group (*n* = 60)**	**Test statistic**	**Cohen's *d***
	M (SD)	***M (SD)***		
Body Dissatisfaction (EDI)	5.6 (5.46)	4.2 (4.44)	$Z = 1.500$	0.28
Ineffectiveness (EDI)	2.9 (4.02)	1.1 (1.37)	$Z = 3.124$***	0.60
Perfectionism (EDI)	6.3 (3.85)	4.1 (2.89)	$W_{(109)} = 3.432$***	0.63
Interpersonal Distrust (EDI)	3.1 (3.81)	1.7 (2.21)	$Z = 2.508$*	0.47
Interoceptive Awareness (EDI)	2.1 (3.7)	0.9 (1.42)	$Z = 1.394$	0.43
Body Attitude Test	22.9 (10.51)	18.8 (9.47)	$t_{(118)} = 2.234$*	0.41
Bodybuilding Dependence (MASS)	12.8 (4.18)	7.2 (3.01)	$Z = 7.351$***	1.55
Muscle Checking (MASS)	7.8 (3.95)	5.2 (2.32)	$Z = 7.351$***	0.80
Substance Use (MASS)	8.9 (4.18)	4.9 (1.43)	$Z = 6.762$***	1.27
Injury Risk (MASS)	9.2 (3.42)	6.5 (2.47)	$W_{(107)} = 4.790$***	0.88
Muscle Satisfaction (MASS)	9.1 (3.24)	9.2 (2.67)	$W_{(114)} = 0.246$	–0.05
MASS total	47.9 (13.21)	33.2 (7.88)	$W_{(96)} = 7.407$***	1.35

Note. * $p < .05$. ** $p < .01$. *** $p < .001$.

4.1.3 Characteristics of self-reported steroid users and non-users

In the present sample of 60 male weightlifters, the prevalence of current steroid use was 9.2 % (n = 11) and the prevalence of food supplement use was 65% (n = 39). Since no one in the undergraduate group reported current steroid or food supplement use, we examined the characteristics of the steroid users in the weightlifter group (Table 4).

According to the results, self-reported steroid users had significantly higher desired body weight and desired BMI, $t_{(58)} = 3.139$, $p < .001$, Cohen's $d = 1.42$ and $Z = 2.398$, $p < .05$, Cohen's $d = 1.19$, respectively. Steroid users reported higher levels of ineffectiveness, $Z = 2.721$, $p < .01$, Cohen's $d = 0.62$, compared to steroid non-users. Moreover, current steroid users displayed significantly higher levels of MD symptoms; thus, current steroid users scored significantly higher on the MASS total scale, $t_{(58)} = 2.879$, $p < .05$, Cohen's $d = 1.34$, Bodybuilding Dependence, $t_{(58)} = 1.917$, $p < .05$, Cohen's $d = 0.87$, Substance Use, $Z = 3.622$, $p < .001$, Cohen's $d = 1.83$, and Injury Risk, $Z = 2.293$, $p < .05$, Cohen's $d = 0.84$, subscales of the MASS than steroid non-users.

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To explore group differences between steroid users and non-users, multiple linear regression analysis was performed. The variables which proved to be significant during the comparison of groups were involved in the analysis, adjusted to age and BMI. According to the results, desired body weight, β = –.39, p = .001, desired BMI, β = –.29, p = .007, the Bodybuilding Dependence, β = –.29, p = .031, and the Substance Use, β = –.57, p < .001, subscales of the MASS, and the MASS total, β = –.40, p = .001, showed significant group differences. Finally, steroid use proved to be a trend predictor of Injury Risk, β = –.23, p = .072. The Ineffectiveness subscale of the EDI did not indicate significant group difference, β = –.18, p = .176.

Table 4

Study variables of steroid users and steroid non-users

	Steroid users (n = 11)	**Steroid non-users (n = 49)**	**Test statistic**	**Cohen's *d***
	M (SD)	***M (SD)***		
Age (years)	25.0 (8.47)	28.4 (7.26)	Z = 1.887	–0.45
Actual body weight (kg)	96.0 (20.46)	86.9 (12.81)	$t_{(58)}$ = 1.411	0.63
Body height (cm)	183.6 (7.13)	180.0 (7.17)	$t_{(58)}$ = 1.475	0.49
BMI	28.4 (5.02)	26.8 (3.63)	Z = 0.841	0.39
Desired body weight (kg)	109.6 (19.84)	90.1 (12.01)	$t_{(58)}$ = 3.139**	1.42
Desired BMI	32.5 (5.31)	27.8 (3.56)	Z = 2.398*	1.19
Body Dissatisfaction (EDI)	4.6 (3.23)	5.8 (5.85)	Z = 0.269	–0.23
Ineffectiveness (EDI)	4.9 (3.41)	2.4 (4.04)	Z = 2.721**	0.62
Perfectionism (EDI)	5.6 (3.20)	6.46 (3.99)	$t_{(58)}$ = 0.645	–0.22
Interpersonal Distrust (EDI)	4.0 (3.49)	3.0 (3.88)	Z = 1.193	0.26
Interoceptive Awareness (EDI)	4.36 (5.10)	1.6 (3.18)	Z = 1.692	0.76
Body Attitude Test	24.0 (11.14)	22.7 (10.47)	$t_{(58)}$ = 0.358	0.12
Bodybuilding Dependence (MASS)	15.7 (5.83)	12.2 (3.47)	$t_{(58)}$ = 1.917*	0.87
Muscle Checking (MASS)	10.2 (5.21)	7.3 (3.46)	Z = 1.883	0.77
Substance Use (MASS)	14.0 (5.31)	7.7 (2.85)	Z = 3.622***	1.83
Injury Risk (MASS)	11.4 (3.80)	8.6 (3.16)	Z = 2.293*	0.84
Muscle Satisfaction (MASS)	9.4 (3.47)	9.0 (3.22)	Z = 0.269	0.13
MASS total	61.0 (17.75)	45.0 (10.08)	$t_{(58)}$ = 2.879*	1.34

Note. * p < .05. ** p < .01. *** p < .001.

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4.1.4 Examination of the risk factors of muscle dysmorphia symptoms

To investigate the relationship between MASS and other constructs and variables, multiple linear regression analysis was performed, adjusted to age (Table 5). According to the results, the weightlifting activity was a significant predictor of MD symptoms, β = -.373, $p < .001$. Ideal body weight revealed a significant positive association with the level of MD, β = .331, $p < .01$. Finally, interoceptive awareness also emerged as a significant predictor of MD symptoms, β = .222, $p < .05$. The explained variance of the model is 45.9%.

Table 5

Explanatory variables of the Muscle Appearance Satisfaction Scale (multiple linear regression analysis)

Predictor variables	**Weightlifter and undergraduate groups (*n* = 120)**	
	β	***t***
Group (1 Weightlifter, 2 Undergraduate)	–.373	–4.518***
Body weight (kg)	–.168	–1.476
Ideal body weight (kg)	.331	2.777**
Body Dissatisfaction (EDI)	–.075	–.876
Ineffectiveness (EDI)	.108	.975
Perfectionism (EDI)	–.016	–.210
Interpersonal Distrust (EDI)	–.134	–1.432
Interoceptive Awareness (EDI)	.222	2.090*
Maturity Fears (EDI)	.106	1.410
Body Attitude Test	.158	1.748
Age (years)	–.058	–.733
R^2	**45.9%**	

Note: R^2 means adjusted explained variance.

* $p < .05$. ** $p < .01$. *** $p < .001$.

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4.2 Adaptation of the Muscle Appearance Satisfaction Scale in Hungary

4.2.1 Characteristics of the samples

The descriptive statistics of all groups are provided in Table 6. The main weightlifter group was significantly older, $t = 15.2$, $p < .0001$, Cohen's $d = 1.33$, and had a greater body weight, $t = 9.2$, $p < .001$, Cohen's $d = 0.83$, and BMI, $t = 12.3$, $p < .001$, Cohen's $d = 1.09$, than the undergraduate group. The undergraduate students had significantly higher body height than the weightlifter group, $t = 12.1$, $p < .001$, Cohen's $d = 0.30$. The distributions of highest education level, marital status, and place of resident were different in the main weightlifter group and undergraduate group: $\chi^2 = 136.3$, $p < .001$, $w = 1.0$; $\chi^2 = 82.9$, $p < .001$, $w = 0.72$; $\chi^2 = 8.5$, $p < .05$, $w = 0.17$ respectively. Weightlifters displayed more divergent education levels than undergraduates, 18% of weightlifters had less than high school education. A higher proportion of weightlifters were married than the undergraduates. Finally, a larger proportion of weightlifters lived outside of the capital than undergraduates.

As for the exercise-related variables in the weightlifter group, 10% ($n = 29$) reported current steroid use, 65% ($n = 188$) reported current food supplement use, and the mean of the years of exercise was 6.1 ($SD = 6.08$). Seventeen percent ($n = 41$) reported current weightlifting activity in the undergraduate group.

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Table 6

Demographics and other characteristics of the samples

	Weightlifters (***n*** **= 289)**	**Undergraduate students (*n* = 240)**	**Weightlifters for test-retest analysis (*n* = 43)**
Anthropometric and demographic variables	***M (SD)***	***M (SD)***	***M (SD)***
Age (*years*)	28.0 (7.43)	20.3 (2.78)	30.4 (6.52)
Body weight (*kg*)	87.8 (14.76)	75.6 (14.70)	88.4 (5.65)
Height (*cm*)	179.6 (6.06)	181.6 (7.48)	179.1 (11.1)
BMI	27.2 (4.13)	22.9 (3.98)	27.5 (3.02)
Level of education	*n* (%)	*n* (%)	*n* (%)
Less than high school	52 (18)		6 (14)
High school graduate	144 (50)	240 (100)	23 (53)
College graduate or more	92 (32)		14 (33)
Marital status			
Single	156 (54)	216 (90)	14 (32)
Married or in a relationship	124 (43)	24 (10)	27 (63)
Divorced	9 (3)	0	2 (5)
Place of residence			
Budapest	104 (36)	106 (44)	9 (22)
Outside Budapest	185 (64)	134 (56)	34 (78)
Psychological variables	*M (SD)*	*M (SD)*	
Self-Esteem (RSES)	20.2 (3.91)	21.2 (5.05)	
Drive for thinness (EDI)	2.4 (3.12)	1.2 (2.40)	

Note. BMI = body mass index. RSES = Rosenberg Self-esteem Scale. EDI = Eating Disorder Inventory.

4.2.2 Examination of the factor structure of the Muscle Appearance Satisfaction Scale

We performed an exploratory factor analysis with the robust weighted least squares estimation and GEOMIN rotation to evaluate the factor structure of 19 items on the weightlifter and undergraduate samples separately. The decision of the factor solution was based on the goodness of fit index (RMSEA < .08, Cfit [90% CI] > .05), the

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interpretability of the solution and salient factor loadings (> .30). We examined one-, two-, three-, four-, five-, six-factor solutions in both samples.

In the weightlifter sample, the RMSEA values were .167 [.159, .175], Cfit < .0001 for the one-factor solution; .122 [.113, .131], Cfit < .001 for the two-factor solution; .103 [.094, .113], Cfit < .001 for the three-factor solution; .081 [.071, .092], Cfit < .001 for the four-factor solution; .060 [.048, 0.073], Cfit = .085 for the five-factor solution and finally .055 [.041, .069], Cfit = .252 for the six-factor solution. CFI values were .725, .870, .919, .957, 980 and .986 respectively. Based on the fit indices and interpretability of factors, we retained the five-factor solution in the weightlifter sample: χ^2 = 180.1, *df* = 86, CFI = .980, TLI = .960. The factors, factor labels, factor loadings and the correlation between factors are presented in Table 7. All items had salient factor loading (> .30) with only one exception of the item referring to self-worth (Bodybuilding Dependence factor, item 15). The self-worth item did not have any salient factor loadings. In the EFA, we replicated the original five-factor solution in the weightlifter sample. The correlations among the factors in the weightlifter group ranged from .01 to .56 (see Table 7). Although the Muscle Satisfaction factor did not correlate with any other factors, the other four factors had moderate correlations with each other.

In the undergraduate sample, RMSEA values were .183 [.174, .192], Cfit < .0001 for the one-factor solution; .079 [.068, .090], Cfit < .001 for the two-factor solution; .061 [.049, .073], Cfit = .072 for the three-factor solution; .047 [.032, .062], Cfit = .607 for a four-factor solution; .032 [.000, .050], Cfit = .946 for the five-factor solution and finally, .022 [.000, .045], Cfit = .984 for the six-factor solution. CFI values were .591, .933, .965, .982, 993 and .997 respectively. Based on the fit indices and interpretability of factors, we retained the three-factor solution in the undergraduate sample: χ^2 = 221.0, *df* = 117, CFI = .965, TLI = .949. The factors and factor loadings are presented in Table 8. In EFA, we found a three-factor solution instead of the original five factors. The items referring to muscle satisfaction were represented as a separate factor. The items referring to bodybuilding dependence and injury risk were represented in one factor, and the items referring to muscle checking and substance use were represented in the third factor. Two items, “addicted” and “supplements”, had salient cross-loadings on two factors (Factor 2 and Factor 3).

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Table 7

Exploratory factor analysis of Muscle Appearance Satisfaction Scale items in the weightlifter group

MASS Item	Factor 1 Muscle Satisfaction	Factor 2 Bodybuilding Dependence	Factor 3 Substance Use	Factor 4 Muscle Checking	Factor 5 Injury Risk	Comm.
			Factor loadings			
Item 4 Satisfied with size	**.84**	.02	–.04	.19	.09	.75
Item 1 Mirror satisfied	**.72**	–.18	.17	–.02	.00	.61
Item 14 Tone	**.64**	.11	.00	–.03	–.11	.29
Item 2 Schedule	.01	**.76**	.02	–.06	.03	.58
Item 8 Bad workout	.10	**.67**	.04	–.01	.01	.47
Item 7 Addicted	.01	**.64**	.20	.15	.01	.71
Item 12 Time at gym	–.07	**.42**	–.06	.09	.12	.29
Item 9 Anything to grow	–.03	.10	**.87**	.01	.00	.84
Item 6 Steroids	.04	.03	**.79**	–.07	.06	.64
Item 17 Bigger means	.04	-.05	**.65**	.10	.28	.74
Item 5 Supplements	–.03	.28	**.49**	.04	–.07	.41
Item 18 Reassurance	.04	–.04	.12	**.87**	–.03	.82
Item 3 Ask friends	.06	.00	.00	**.81**	–.06	.62
Item 19 Resist checking	–.02	.15	.02	**.68**	.14	.72
Item 11 Mirror	–.11	.22	–.04	**.59**	.07	.57
Item 16 I ignore pain	.01	.00	.00	–.03	**.91**	.81
Item 13 One must ignore	–.04	.02	.15	–.02	**.74**	.66
Item 10 Sore	.10	.19	–.02	.06	**.60**	.58
Item 15 Self-worth	–.07	.18	.17	.22	.21	.37
Eigenvalues	7.25	2.23	1.39	1.36	1.07	
			Factor correlations			
Bodybuilding Dependence	–.07					
Substance Use	.17	.39***				
Muscle Checking	.01	.52***	.47***			
Injury Risk	.07	.56***	.39***	.45***		
			Descriptive statistics			
Cronbach α	.75	.73#	.80	.83	.81	
[95% CI]	[.70, .79]	[.67, .77]	[.76, .84]	[.79, .86]	[.76, .84]	
Mean	9.33	11.06	8.67	8.41	9.47	
SD	2.96	4.05	4.31	3.93	3.46	

Note. Rotation method is GEOMIN. Salient factor loadings (> .30) are shown in boldface. Comm. = communalities. # Calculated without "self-worth" item. *** $p < .001$.

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Table 8
Exploratory Factor Analysis of the Muscle Appearance Satisfaction Scale items in the undergraduate group

MASS item	Factor 1 Muscle Satisfaction	Factor 2 Dependence and Injury Risk	Factor 3 Muscle Checking and Substance Use	Comm.
		Factor loadings		
Item 4 Satisfied with size	**.94**	–.06	–.03	.88
Item 14 Tone	**.87**	–.20	.02	.81
Item 1 Mirror satisfied	**.82**	.01	–.26	.69
Item 10 Sore	.00	**.93**	–.20	.71
Item 16 I ignore pain	.10	**.74**	.02	.57
Item 12 Time at gym	–.05	**.63**	.26	.64
Item 13 One must ignore	.12	**.62**	–.01	.39
Item 5 Supplements	–.09	**.57**	**.32**	.62
Item 8 Bad workout	.10	**.47**	.26	.42
Item 7 Addicted	.02	**.43**	**.44**	.59
Item 2 Schedule	.01	**.42**	.22	.31
Item 18 Reassurance	–.10	–.02	**.91**	.79
Item 9 Anything to grow	.10	–.13	**.78**	.54
Item 19 Resist checking	–.12	.20	**.61**	.54
Item 11 Mirror	–.12	.19	**.58**	.49
Item 17 Bigger means	.24	.20	**.55**	.54
Item 6 Steroids	–.02	.06	**.53**	.31
Item 15 Self-worth	.07	.17	**.51**	.39
Item 3 Ask friends	.06	.09	**.51**	.32
Eigenvalues	7.25	2.69	1.56	
		Factor correlations		
Dependence and Injury Risk	–.04			
Muscle Checking and Substance Use	.10	.54***		
		Descriptive statistics		
Cronbach α	.88	.76#	.79	
[95% CI]	[.85, .90]	[.71, .81]	[.75, .83]	
Mean	9.33	20.32	13.09	
SD	2.96	6.16	4.58	

Note. Rotation method is GEOMIN. Salient factor loadings (> .30) are shown in boldface. Comm. = communalities.
The internal consistency was calculated without item "addicted".
*** $p < .001$.

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4.2.3 Reliability of the Muscle Appearance Satisfaction Scale

4.2.3.1 Scale score reliability

The scale score reliability of the MASS was calculated using Cronbach's alpha coefficient in both groups (see Table 7 and Table 8). The MASS and its subscales had good score reliability in the weightlifter group (α = .73–.83). The Cronbach α of the total scale was excellent (α = .87, 95% CI [.85, .89]). The score reliabilities of the three factors in the undergraduate group were satisfactory (αs = .76–.88). The Cronbach α of the total scale was good (α = .81, 95% CI [.77, .84]).

4.2.3.2 Test-retest reliability

In order to calculate the test-retest reliability, correlation coefficients and intraclass correlations of the MASS scores were calculated in Sample 3. The time interval between the two administrations was two weeks. Correlations and intraclass correlations are presented in Table 9. The results indicated that the total scale and the subscales scores had excellent test-retest reliability. The test-retest correlations were between .84–.91 measured by Pearson's correlation, and .82–.91 measured by intraclass correlation. The lowest correlation was found in the Injury Risk subscale. The total scale and all subscales showed test–retest correlations greater than .80.

Table 9

Test-retest reliability and intraclass correlation coefficients of the Muscle Appearance Satisfaction Scale

Scale	**Test-retest correlations (*n* = 43)**	**Intraclass correlation (*n* = 43)**
	r	ICC [95% CI]
Bodybuilding Dependence	.89***	.87 [.78, .93]
Muscle Checking	.90***	.86 [.76, .92]
Substance Use	.91***	.90 [.82, .94]
Injury Risk	.84***	.82 [.68, .90]
Muscle Satisfaction	.91***	.91 [.84, .95]
MASS Total	.91***	.90 [.82, .94]

Note. *r* = Pearson's correlation. ICC = intraclass correlation.
*** $p < .001$.

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4.2.4 Construct validity of the Muscle Appearance Satisfaction Scale

The authors estimated a multivariate regression analysis in each group to examine the construct validity of the MASS factors. Table 10 presents coefficients of the multivariate model for weightlifters (see Figure 6). The analysis provided support for Hypothesis 1, 3, 6, and 7. Hypothesis 1 was supported as younger age was associated with Muscle Checking, Substance Use, Injury Risk, and Bodybuilding Dependence factors of the MASS. Hypothesis 3 was confirmed as lower self-esteem was related with muscle dissatisfaction, Muscle Checking, Substance Use, and Bodybuilding Dependence factors of the MASS. Hypothesis 6 was supported as current steroid use was correlated with Muscle Checking, Substance Use, Injury Risk, and Bodybuilding Dependence factors. Finally, Hypothesis 7 was also supported as the use of food supplements was associated with Substance Use, Muscle Checking, and Bodybuilding Dependence factors. Contrary to expectations, Hypothesis 2, 4, and 5 were not supported by the model. Thus, Hypothesis 2 was not confirmed as BMI was negatively related with Injury Risk factor. Hypothesis 4 was neither confirmed as Drive for thinness was not significantly correlated with any factor of the MASS. Finally, Hypothesis 5 was also not supported as fewer years spent with exercising was linked with Muscle Satisfaction.

In the undergraduate group, the multivariate analysis involved only three factors which scores were also calculated with the sum of the items. Items belonged to the factors where the highest factor loading was observed. Only the items “addicted” and “supplements” were not used in the calculation due to double loadings. The regression coefficients are presented in Table 11. In this model we had only three observed scores. The analysis provided support for Hypothesis 3, 4, and 8. Hypothesis 3 was supported as lower self-esteem was associated with muscle dissatisfaction and Muscle Checking/Substance Use factors. Hypothesis 4 was confirmed as Drive for thinness was related with Muscle Checking/Substance Use factor. Finally, Hypothesis 8 was also supported as weightlifting activity was linked with all factors of the MASS. Contrary to the expectations, Hypothesis 1 and 2 were not supported by the model as neither age, nor BMI was significantly correlated with any factor of the MASS.

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Table 10

Multivariate analysis of the predictors of the Muscle Appearance Satisfaction Scale subscales in the weightlifter sample (standardized coefficients).

Factors	**Age**	**BMI**	**Self-esteem**	**Drive for Thinness**	**Years of exercise**	**Food supplementation**	**Current steroid use**	R^2
Muscle Satisfaction	.05	.09	**–.31*** **	.01	**–.18** **	.06	–.04	14.8 %
Substance Use	**–.15** **	.05	**–.12***	–.04	–.02	**.30*** **	**.37*** **	33.4 %
Injury Risk	**–.32*** **	**–.17** **	–.09	–.07	.07	.08	**.11***	17.8 %
Muscle Checking	**–.20*** **	.05	**–.14***	.08	–.02	**.14***	**.18** **	15.2 %
Bodybuilding Dependence	**–.24*** **	.06	**–.17** **	.09	.11	**.15** **	**.16** **	17.8%

Note. Significant coefficients are shown in boldface. BMI = body mass index.
* $p < .05$. ** $p < .01$. *** $p < .001$.

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Table 11

Multivariate analysis of the Muscle Appearance Satisfaction Scale subscales in the undergraduate sample (standardized coefficients).

Factors	**Age**	**BMI**	**Self-esteem**	**Drive for Thinness**	**Weightlifting activity**	R^2
Muscle Satisfaction	.01	-.11	**–.36*****	.06	**–.13***	17.6%
Bodybuilding Dependence and Injury Risk	.03	-.01	–.08	.07	**.40*****	16.8%
Muscle Checking and Substance Use	–.03	.07	**–.15***	**–.12***	**.20***	7.8%

Note. Significant coefficients are shown in boldface. BMI = body mass index.

* $p < .05$. ** $p < .01$. *** $p < .001$.

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4.3 Muscle dysmorphia among Hungarian male weightlifters

4.3.1 Characteristics of the sample

Table 12 contains descriptive statistics (means, standard deviations, ranges, frequencies) for the anthropometric, exercise-related, and demographic variables. Participants in the current study had the mean age of 27.8 (*SD* = 7.40) years. The mean body height of the study sample was 179.5 cm (*SD* = 6.05), and the mean body weight was 87.5 (*SD* = 14.63) kg. The desired body weight of the respondents (*M* = 90.7, *SD* = 14.56 kg) was significantly higher than their actual body weight, $t_{(303)} = 5.595$, $p < .001$, Cohen's $d = 0.49$. The difference between their actual and desired body weight was 3.2 kg (*SD* = 9.89). Conversely, one point difference was found between their actual (*M* = 27.1, *SD* = 4.08) and ideal BMIs (*M* = 28.1, *SD* = 3.87), $t_{(303)} = 5.547$, $p < .001$, Cohen's $d = 0.55$. Participants lifted weights at a mean of four times per week for six years. Almost 20% of the sample had less than high school education, 50% graduated in high school, and 31% graduated in college. Relating to the marital status, half of the sample (53%) was single, less than half was married or lived in relationship (44%), and a small proportion was divorced (2.3%). Finally, 35 % of the respondents lived in Budapest and the larger proportion of sample (65%) lived outside of the capital.

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Table 12

Descriptive statistics of the sample: anthropometric, demographic, and exercise-related variables

	Total sample (*n* = 304)	
Anthropometric variables	**Range**	***M* (*SD*)**
Age (years)	18–58	27.8 (7.40)
Body height (cm)	161–198	179.5 (6.05)
Body weight (kg)	51–156	87.5 (14.63)
Desired body weight	60–160	90.7 (14.56)
Difference between desired and actual body weight (kg)	–26–51	3.2 (9.89)
Body mass index	16.1–47.1	27.1 (4.08)
Desired body mass index	19.6–46.3	28.1 (3.87)
Difference between desired and actual body mass index	–7.9–15.9	1 (3.04)
Exercise related variables		
Workouts/week	1–14	3.9 (1.22)
Years of exercise	0–41	6.1 (6.03)
Highest level of education		*n* (%)
Less than high school		58 (19.1%)
High school graduate		151 (49.7%)
College graduate or more		95 (31.3%)
Marital status		
Single		163 (53.6%)
Married or in a relationship		133 (43.8%)
Divorced		8 (2.6%)
Place of residence		
Budapest		107 (35.2%)
Outside Budapest		197 (64.8%)

Table 13 presents the descriptive statistics (ranges, means and 95% *CI*s, *SD*s, Cronbach alphas and 95% *CI*s) of the study variables. Internal consistency reliabilities of the applied measures ranged from acceptable to good.

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Table 13

Descriptive statistics of the psychological variables of the sample

Variables	**Total sample (*n* = 304)**		
	Range	***M* (*SD*) [95% CI]**	**Cronbach α (item number) [95% CI]**
Bodybuilding Dependence (MASS)	5–25	13.3 (4.64) [12.8, 13.8]	.74 (5) [.69, .79]
Muscle Checking (MASS)	4–20	8.3 (3.87) [7.9, 8.8]	.82 (4) [.79, .85]
Substance Use (MASS)	4–20	8.6 (4.28) [8.1, 9.1]	.81 (4) [.77, .84]
Injury Risk (MASS)	3–15	9.4 (3.44) [9.0, 9.8]	.80 (3) [.76, .84]
Muscle Satisfaction (MASS)	3–15	9.3 (2.67) [9.0, 9.6]	.74 (3) [.69, .79]
MASS total	22–83	48.9 (13.37) [47.4, 50.4]	.87 (19) [.85, .89]
Exercise Dependence	6–30	16.5 (5.08) [15.9, 17.1]	.74 (6) [.69, .78]
Trait Anxiety (STAI)	21–71	40.0 (8.60) [39.1, 41.0]	.87 (20) [.85, .89]
Self-Esteem (RSES)	18–40	30.3 (3.92) [29.8, 30.7]	.82 (10) [.78, .85]
Self Efficacy (GSES)	10–40	30.5 (4.27) [30.0, 31.0]	.88 (10) [.85, .90]
SCOFF	0–5	0.5 (0.71) [0.4, 0.5]	.26 (5) [.12, .39]
Drive for thinness (EDI)	0–18	2.4 (3.12) [2.1, 2.8]	.70 (7) [.64, .74]
Bulimia (EDI)	0–14	0.7 (1.60) [0.5, 0.9]	.40 (7) [.29, .50]
Interoceptive Awareness (EDI)	0–18	1.3 (2.30) [1.0, 1.6]	.70 (10) [.64, .75]
Perfectionism (EDI)	0–16	4.5 (3.68) [4.1, 4.9]	.72 (6) [.66, .76]
Interpersonal Distrust (EDI)	0–17	2.5 (3.08) [2.2, 2.9]	.75 (7) [.71, .79]

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Relating to the body weight goal categories, 9.5% (n = 29) of the participants would like to remain in their current body weight, 30.9% (n = 94) would like to lose weight, and 59.5% (n = 181) would like to gain weight. Half of the participants (48.4%) wanted to achieve notable weight gain (at least 5 kg).

Figure 7 shows the means of subjective satisfaction with body weight and musculature and subjective importance of weight loss and muscle mass gain as training objectives in different weight goal categories (i.e., would like to lose weight, would like to remain in the current weight, and would like to gain weight). According to the results of the comparison of the means, body weight goals were significantly associated not only with body weight satisfaction and subjective importance of weight loss, $rW3_{(2)}$ = 35.723, p < .001, and $H_{(2)}$ = 74.026, p < .001, respectively, but also with muscle mass satisfaction and subjective importance of muscle mass gain, $H_{(2)}$ = 8.525, p = .014, and $rW3_{(2)}$ = 23.945, p < .001, respectively. Results of the post-hoc tests of pairwise stochastic equalities indicated that those who would like to remain in their current body weight had significantly higher level of muscle mass satisfaction, comparing to those who would like to gain or lose weight. In this respect, the latter two groups did not differ significantly. The level of the subjective importance of muscle mass gain was significantly higher among those who would like to gain weight comparing to those who would like to lose weight and those who would like to remain in their current weight. In this respect, the latter two groups did not differ significantly.

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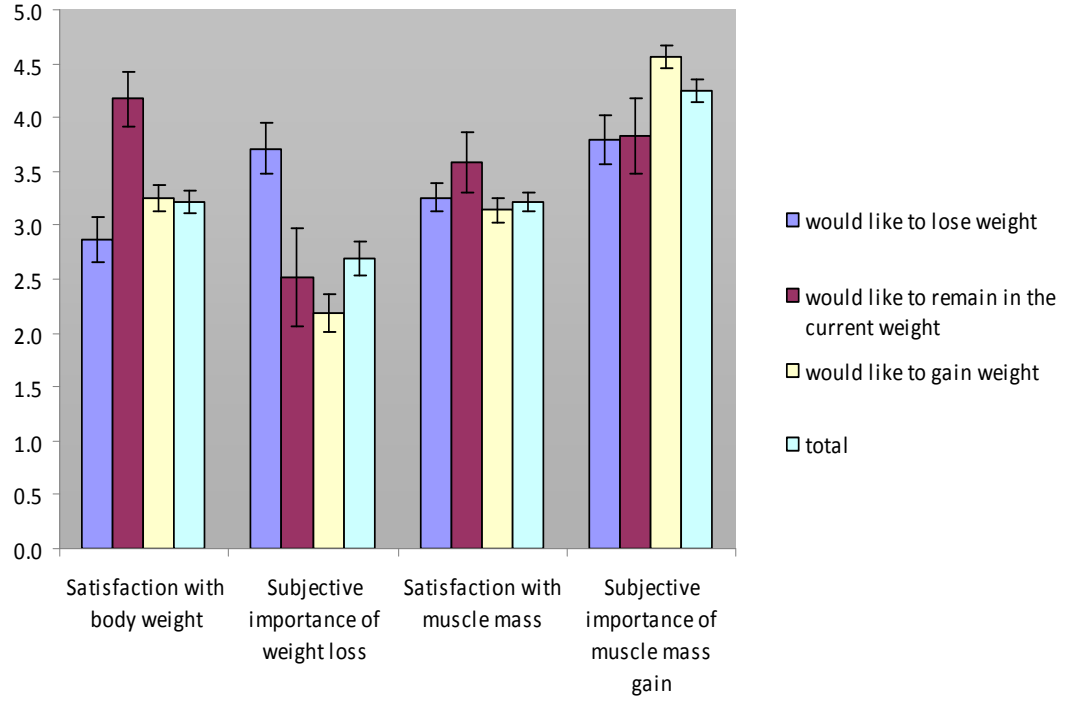

Figure 7. Subjective satisfaction with body weight and musculature and subjective importance of weight loss and muscle mass gain as training objectives in different weight goal categories. The figure presents 95% confidence intervals of the means.

4.3.1.1 Prevalence of exercise dependence among Hungarian male weightlifters

In the current study the prevalence rate of exercise dependence categories were: 29.6% (n = 90) asymptomatic, 61.2% (n = 182) symptomatic non-dependent, and 9.2% (n = 28) at risk for exercise dependence. The exercise dependence categories – asymptomatic, symptomatic non-dependent, and at risk for exercise dependence – were defined using the modified cut-off scores of Exercise Addiction Inventory (Mónok et al., 2012).

4.3.1.2 Prevalence of eating disorders among Hungarian male weightlifters

In the present study a short screening tool (SCOFF) for the assessment of eating disorders was used. Two or more scores indicated a likely case of AN or BN. Results suggested that 8.5% (n = 26) of the participants was likely to have an eating disorder (AN or BN).

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4.3.2 Prevalence of muscle dysmorphia among Hungarian male weightlifters (latent class analysis)

To identify a group of muscle dysmorphic male weightlifters, a latent class analysis was performed with ten variables associated with the diagnostic criteria of MD. We estimated one to four class solutions. Table 15 demonstrates the information based criteria and entropy for the model solutions. The Akaike information criteria (AIC), Bayesian information criteria (BIC), and sample size–adjusted BIC declined as more latent classes were added. The three- and four-latent class solution had the highest levels of entropy. Based on the L-M-R test, the three-class solution was accepted. Table 14 reports the descriptive statistics for indicators of the LCA 3-class model, which included high risk MD group (18.0%, n = 55), low risk MD group (51.6%, n = 157), and normal weightlifters group (30.2%, n = 92).

The high risk MD group represents those weightlifters who can be characterized by the diagnostic criteria of MD (Pope et al., 1997). This group had the highest means on all subscales of the MASS, except on the Muscle Satisfaction subscale, on which all three classes had almost the same means. This group displayed the highest level of exercise addiction (M = 21.7, SE = 0.90); conversely exercised the most frequently and spent the most time with work-outs (quantity-frequency of exercise: M = 11.6, SE = 1.16). The frequency of supplement use was also the highest (86.7%) in this group comparing to the other two groups. The lifetime (67.8%) and current prevalence (40.6%) of AAS use were also the highest comparing to the other classes.

The group of normal weightlifters represents those males who had the lowest means on the indicator variables. Thus, this group had the lowest means on all subscales of the MASS, exercise addiction (M = 12.2, SE = 0.55), and quantity-frequency of exercise (M = 6.0, SE = 0.36). Moreover, the frequency of supplement use (50.4%), the lifetime (10.7%) and current prevalence (1.1%) of AAS use were also the lowest in this group comparing to the other classes.

One additional group of weightlifters was identified, the low risk MD group, who had the medium means on the indicator variables comparing to the normal weightlifters and high risk MD group. That is, this group had medium means on all subscales of the

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MASS, exercise addiction (*M* = 17.2, *SE* = 0.56), and quantity-frequency of exercise (*M* = 8.1, *SE* = 0.40) relative to the other classes. The frequency of supplement use (66.8%), the lifetime (24.0%) and current prevalence (5.2%) of AAS use also represented in-between values relative to the normal and muscle dysmorphic groups.

The results support Hypothesis 1 as the prevalence rate of MD among Hungarian male weightlifters in this study is comparable to the international data. Additionally, these results also confirmed Hypothesis 2 as the prevalence of both current and lifetime use of AAS and supplements was far more higher in the high risk MD group comparing to the other two groups. The lifetime prevalence of AAS use was 68% in the high risk MD group and still 41% of the participants in this group were current AAS user. These prevalence rates were notably lower in the low risk MD group as the lifetime prevalence of AAS use was 24% and only 5% of them used AAS currently. The prevalence of AAS use was the lowest in the group of normal weightlifters as the lifetime prevalence of AAS use was 11% and only 1% of them used AAS currently.

Table 14

Descriptive statistics for indicators of the latent class analysis 3-class model

Variables	**Normal weightlifters (*n* = 92)**	**Low risk MD group (*n* = 157)**	**High risk MD group (*n* = 55)**
	***M* (*SE*)**	***M* (*SE*)**	***M* (*SE*)**
1. Bodybuilding Dependence (MASS)	8.6 (0.44)	14.4 (0.60)	18.4 (0.81)
2. Muscle Checking (MASS)	5.6 (0.32)	8.3 (0.45)	12.9 (0.66)
3. Substance Use (MASS)	5.5 (0.28)	8.2 (0.45)	14.9 (0.72)
4. Injury Risk (MASS)	6.3 (0.67)	10.1 (0.25)	12.7 (0.52)
5. Muscle Satisfaction (MASS)	9.1 (0.31)	9.1 (0.22)	9.8 (0.39)
6. Exercise Dependence (EAI)	12.2 (0.55)	17.2 (0.56)	21.7 (0.90)
7. QF of exercise	6.0 (0.36)	8.1 (0.40)	11.6 (1.16)
8. Supplement use (%)	50.4%	66.8%	86.7%
9. Current AAS use (%)	1.1%	5.2%	40.6%
10. Lifetime AAS use (%)	10.7%	24.0%	67.8%

Note. *SE* = standard error. Variables 1-5 represent the 5 subscales of the Muscle Appearance Satisfaction Scale. Variable 6 is the Exercise Addiction Inventory. Variable 7 (QF of exercise) indicates quantity-frequency of exercise. Variables 8-10 were retrieved from the exercise related variables.

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Table 15

Fit indices for the latent class analysis of the models

Number of latent classes	AIC	BIC	SSABIC	Entropy	L-M–R test	*p*
2 classes	12452	12557	12468	0.820	502.7	0.0052
3 classes	12282	12427	12303	0.821	188.7	0.0287
4 classes	12190	12376	12218	0.847	110.2	0.0843

Note. AIC = Akaike Information Criteria; BIC = Bayesian Information Criteria; SSABIC = Sample size adjusted Bayesian Information Criteria; L-M-R Test = Lo-Mendell-Rubin adjusted likelihood ratio test value; *p*: *p*-value associated with LM-R Test.

4.3.3 Determination of the tentative cut-off score of the Muscle Appearance Satisfaction Scale

Based on the membership in the high risk MD group as a 'gold standard', the sensitivity, specificity, positive predictive value, negative predictive value, and accuracy of the MASS at several possible cut-off points were calculated (Table 16). Cut-off scores of 60, 61, and 62 showed the best accuracy. A cut-off at 60 resulted in acceptable sensitivity (83%), with a higher specificity (98%) and accuracy (95%). At the next cut-off score at 61 the sensitivity was better (89%) with a still high specificity (96%) and accuracy (95%). At the cut-off point of 62, sensitivity was acceptable (84%) with almost the same specificity (97%) and accuracy (95%). Based on the results, the cut-off of 62 was chosen on the basis that it maximizes the presence and absence of MD. During the trade-off between sensitivity and specificity –where increased specificity (proportion of true negatives) is obtained at the expense of decreased sensitivity (proportion of true positives)– we aimed to exclude all non-MD cases instead of detecting all MD cases. It is argued that, for screening tests specificity has to be sacrifice for the sake of sensitivity as false positive cases will be identified in further assessments (Rey, Morris-Yates, & Stay, 1992). Although we suggest a score of 62 of the MASS as an appropriate cut-off for identifying MD cases among male weightlifters, information about the sensitivity and specificity of the scale at several cut-points is listed in Table 16. Thus, users of the scale may determine a different cut-off as a more appropriate one.

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Table 16

Calculation of cut-off score for the Muscle Appearance Satisfaction Scale

	True positive (*n*)	True negative (*n*)	False positive (*n*)	False negative (*n*)	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
50/51	55	176	0	73	43	100	100	71	76
51-52	55	176	73	0	100	71	43	100	76
52-53	55	183	66	0	100	73	45	100	78
53-54	55	193	56	0	100	78	50	100	82
54/55	55	200	49	0	100	80	53	100	84
55/56	55	209	40	0	100	84	58	100	87
56/57	54	211	38	1	98	85	59	100	87
57/58	53	215	34	2	96	86	61	99	88
58/59	53	225	24	2	96	90	69	99	91
59/60	52	228	21	3	95	92	71	99	92
60/61	49	239	6	10	83	98	89	96	95
61/62	49	239	10	6	89	96	83	98	95
62/63	**46**	**242**	**7**	**9**	**84**	**97**	**87**	**96**	**95**
63/64	43	243	6	12	78	98	88	95	94
64/65	41	245	4	14	75	98	91	95	94
65/66	40	247	2	15	73	99	95	94	94
66/67	35	248	1	20	64	100	97	93	93
67/68	32	248	1	23	58	100	97	92	92

Note. PPV = positive predictive value; NPV = negative predictive value.

4.3.4 Psychological correlates of muscle dysmorphia

Table 17 reports one-way ANOVA results for the comparison of anthropometric data, age, and psychological correlates of the normal weightlifters, low risk, and high risk MD groups. The analysis provided support for Hypothesis 3, 4, and 5.

4.3.4.1. Anthropometric data and age

An analysis of variance showed that the high risk and low risk MD group were significantly younger than the normal weightlifters, $F_{(2)} = 8.363$, $p < .001$. The high risk MD group had significantly higher BMI comparing to the low risk MD group and normal weightlifters, $F_{(2)} = 4.324$, $p = .014$. Moreover, their desired BMI and weight dissatisfaction were also significantly higher comparing to the low risk MD group and normal weightlifters, $W_{(2)} = 16.187$, $p < .001$ and $F_{(2)} = 7.873$, $p < .001$, respectively. Additionally, the low risk MD group reported significantly higher desired BMI than the normal weightlifters.

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4.3.4.2 Psychological correlates

Hypothesis 3 was confirmed as the high risk MD group had the lowest level of self-esteem comparing to the other two groups; moreover, the low risk MD group also had significantly lower level of self-esteem than normal weightlifters, $F_{(2)} = 12.847$, $p < .001$.

Hypothesis 4 was supported as high risk MD group displayed higher levels of eating disorder related psychopathological characteristics, than normal weightlifters: the high risk MD group had significantly higher levels of drive for thinness, $H_{(2)} = 11.468$, $p = .003$, and interoceptive awareness, $rW3_{(2)} = 5.777$, $p = .004$, comparing to the group of normal weightlifters and had significantly higher levels of perfectionism, $H_{(2)} = 29.861$, $p < .001$, and interpersonal distrust, $rW3_{(2)} = 4.399$, $p = .014$, comparing to the normal weightlifters and low risk MD group. Additionally, the low risk MD group reported significantly higher levels of drive for thinness, perfectionism, and interoceptive awareness than normal weightlifters.

Hypothesis 5 was also supported as the high risk MD group had significantly higher level of trait anxiety comparing to the normal weightlifters and low risk MD group; moreover, the low risk MD group also had significantly higher level of trait anxiety than normal weightlifters, $F_{(2)} = 11.510$, $p < .001$.

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Table 17

One-way ANOVA for the comparison of anthropometric data, age, and psychological correlates of the normal weightlifters, low risk, and high risk muscle dysmorphia groups

Variable	Normal weightlifters (*n* = 92)	Low risk MD group (*n* = 157)	High risk MD group (*n* = 55)	η^2	Test statistic
	***M* (*SD*) [95% CI]**	***M* (*SD*) [95% CI]**	***M* (*SD*) [95% CI]**		
Age	30.4 (7.81)[b,c] [28.7, 32.0]	26.9 (7.16)[a] [25.8, 28.0]	26.2 (6.34)[a] [24.5, 27.9]	.053	$F_{(2)} = 8.363$***
BMI	26.7 (4.01)[c] [25.8, 27.5]	26.9 (4.08)[c] [26.3, 27.5]	28.6 (3.93)[a,b] [27.5, 29.6]	.028	$F_{(2)} = 4.324$*
Desired BMI	26.8 (3.03)[b,c] [26.2, 27.4]	27.9 (3.65)[a,c] [27.4, 28.5]	30.7 (4.51)[a,b] [29.5, 31.9]	.116	$W_{(2)} = 16.187$***
Weight dissatisfaction	0.5 (7.99)[c] [-1.1, 2.2]	3.4 (10.03)[c] [1.8, 5.0]	7.0 (11.12)[a,b] [4.0, 10.0]	.050	$F_{(2)} = 7.873$***
Trait Anxiety (STAI)	37.3 (8.33)[b,c] [35.5, 39.0]	40.2 (8.41)[a,c] [38.9, 41.5]	44.0 (7.98)[a,b] [41.9, 46.2]	.071	$F_{(2)} = 11.510$***
Self-Esteem (RSES)	31.6 (3.92)[b,c] [30.8, 32.4]	30.2 (3.72)[a,c] [29.6, 30.8]	28.3 (3.70)[a,b] [27.3, 29.3]	.079	$F_{(2)} = 12.847$***
Self-Efficacy (GSES)	31.0 (4.41) [30.1, 31.9]	30.5 (3.93) [29.9, 31.1]	29.7 (4.90) [28.4, 31.1]	.010	$F_{(2)} = 1.506$
Drive for Thinness (EDI)	1.9 (3.06)[b,c] [1.2, 2.5]	2.7 (3.14)[a] [2.2, 3.2]	2.8 (3.11)[a] [2.0, 3.6]	.015	$H_{(2)} = 11.468$**
Interoceptive Awareness (EDI)	0.6 (0.97)[b,c] [0.4, 0.8]	1.4 (2.15)[a] [1.0, 1.7]	2.3 (3.59)[a] [1.3, 3.2]	.058	$rW3_{(2)} = 5.777$**
Perfectionism (EDI)	2.9 (2.92)[b,c] [2.3, 3.5]	4.8 (3.59)[a,c] [4.2, 5.3]	6.2 (4.09)[a,b] [5.1, 7.3]	.098	$H_{(2)} = 29.861$***
Interpersonal Distrust (EDI)	1.9 (2.16)[c] [1.5, 2.4]	2.4 (3.00)[c] [1.9, 2.9]	4.0 (4.09)[a,b] [2.9, 5.1]	.051	$rW3_{(2)} = 4.399$*

Note. CI = confidence interval. η^2 is a measure of effect size for use in ANOVA with .02 representing small, .05 medium, and .08 large effect sizes. Superscripts indicate significant ($p < .05$) group differences during post-hoc tests.
Weight dissatisfaction was counted as the actual body weight minus the desired body weight.
[a] Significant difference between normal weightlifters and other groups.
[b] Significant difference between low risk MD group and other groups.
[c] Significant difference between high risk MD group and other groups.
* $p < .05$. ** $p < .01$. *** $p < .001$.

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4.3.4.3 Eating disorders in normal weightlifters, low risk, and high risk muscle dysmorphia groups

Table 18 presents the prevalence rate of cases likely to have eating disorder in normal weightlifters, low risk, and high risk MD groups. The number of cases likely to have eating disorder was almost the same in the high risk MD group and low risk MD group (10.9% and 9.5%, respectively). Furthermore, the results of the Chi-square test did not indicate significant association between MD and eating disorders, $\chi^2_{(2)} = 1.735$, $p = .420$.

Table 18

The prevalence of cases likely to have eating disorder in normal weightlifters, low risk, and high risk muscle dysmorphia groups

SCOFF category	**Normal weightlifters *n* (%)**	**Low risk MD group *n* (%)**	**High risk MD group *n* (%)**
Cases without eating disorder	87 (94.5%)	142 (90.4%)	49 (89.0%)
Cases likely to have eating disorder	5 (5.4%)	15 (9.5%)	6 (10.9%)

4.3.4.4 Body weight goals in normal weightlifters, low risk, and high risk MD groups

Figure 8 presents the frequency of different weight goals (i.e., weight loss, remain in the current weight, and weight gain) in normal weightlifters, low risk, and high risk MD groups. Results of the Chi-square test indicated that the frequency of the desire toward weight gain was significantly higher in the high risk MD group (73%) comparing to the low risk MD group (62%) and normal weightlifters (47%). Additionally, the frequency of the desire toward weight loss was significantly lower in the high risk MD group (20%) comparing to the other two groups (31% and 38%, respectively), $\chi^2_{(4)} = 12.456$, $p < .001$.

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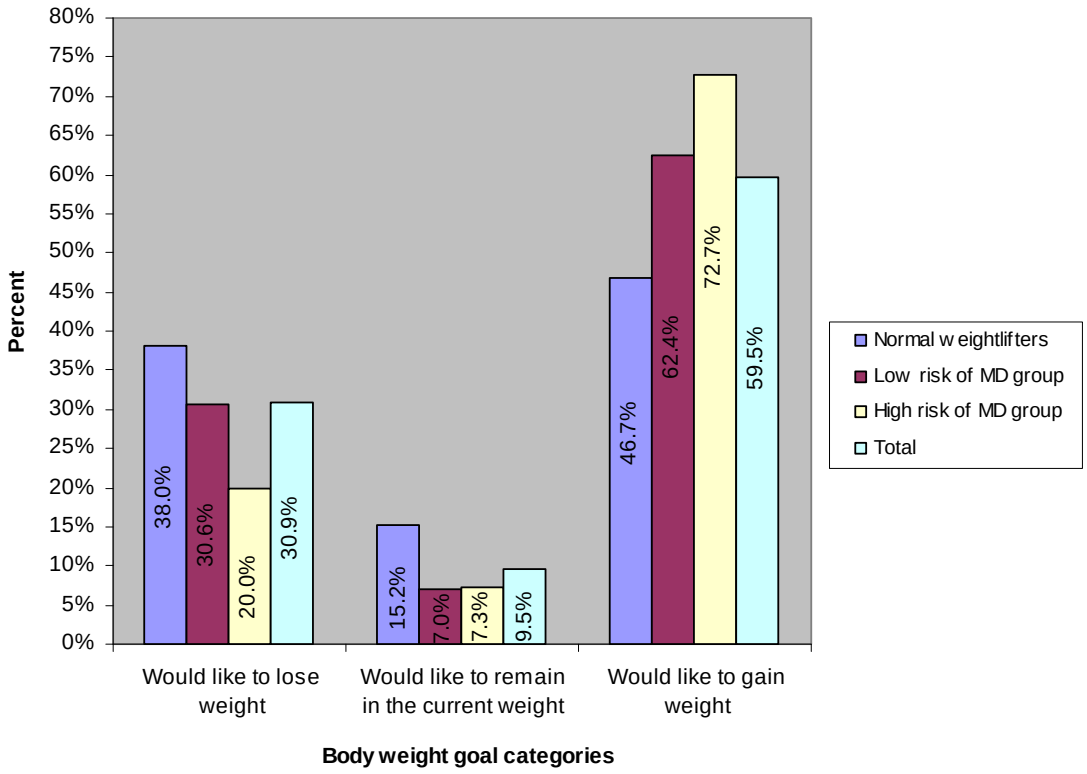

Figure 8. The frequency of different weight goals in normal weightlifters, low risk, and high risk muscle dysmorphia groups

4.3.5 Anabolic-androgenic steroid use

4.3.5.1 Prevalence of anabolic-androgenic steroid use among Hungarian male weightlifters

The results relating to the AAS use supported Hypothesis 6 as of the 304 subjects, 17.4% (n = 53) reported past AAS use and 10.2% (n = 31) reported current AAS use. Based on these data, the lifetime prevalence of AAS use among the participants was 27.6% (n = 84). The prevalence of food supplement use was also high since more than half (65.1%, n = 198) of the respondents reported the use of them.

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4.3.5.2 Characteristics of anabolic-androgenic steroid users

To examine the characteristics of AAS users, one-way analysis of variance was applied (results are displayed in Table 20). Because some earlier studies have differentiated current and past AAS users (Cole et al., 2003; Goldfield & Woodside, 2009; Kanayama et al., 2006) and also because the psychological correlates may be different in these two groups, current and past AAS users were distinguished and compared with non-users in the present study.

4.3.5.2.1 Anthropometric data and age

According to the results, current steroid users had significantly higher BMI than non-users and past users, $F_{(2)} = 10.383$, $p < .001$. Despite of their higher BMI, current steroid users also reported significantly higher desired BMI than past steroid users and non-users. Past steroid users also had significantly higher desired BMI than steroid non-users, $W_{(2)} = 12.922$, $p < .001$. Age did not significantly relate to steroid use, $F_{(2)} = 0.421$, $p = .657$.

4.3.5.2.2 Muscle dysmorphia related variables

Results also confirmed Hypothesis 7 as current steroid users displayed significantly higher levels of MD symptoms; thus, current AAS users scored significantly higher on the MASS total scale, $F_{(2)} = 23.974$, $p < .001$, Bodybuilding Dependence, $F_{(2)} = 9.395$, $p < .001$, and Substance Use, $rW3_{(2)} = 80.926$, $p < .001$, subscales of the MASS than the past steroid users and non-users, and scored significantly higher on the Muscle Checking, $H_{(2)} = 15.623$, $p < .001$, and Injury Risk, $H_{(2)} = 14.980$, $p < .001$, subscales of the MASS than steroid non-users. Past steroid users scored significantly higher on the MASS total scale, the Bodybuilding Dependence, the Substance Use, and the Injury Risk subscales of the MASS than steroid non-users. Interestingly the Muscle Satisfaction subscale of the MASS did not indicate any significant difference between the groups, $W_{(2)} = 0.136$, $p = .873$.

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4.3.5.2.3 Exercise dependence

Results also revealed that both current and past steroid users had higher levels of exercise dependence than steroid non-users, $F_{(2)} = 9.389$, $p < .001$. Moreover, the examination of the prevalence rate of exercise dependence among steroid non-users and lifetime steroid users revealed that the prevalence rate of exercise dependence was significantly higher in lifetime steroid users (14.3%, $n = 12$) compared to steroid non-users (7.3%, $n = 16$), $\chi^2_{(2)} = 10.983$, $p < .001$. Table 19 presents the prevalence rates of asymptomatic, symptomatic non-dependent, and at risk for exercise dependence among steroid non-users and lifetime steroid users. Sixty-nine percent of the lifetime steroid users and 58% of steroid non-users were identified as symptomatic non-dependent.

Table 19

The prevalence of asymptomatic, symptomatic non-dependent, and at risk for exercise dependence among steroid non-users and lifetime steroid users

Exercise dependence category	**Steroid non-users**	**Lifetime steroid users**
	***n* (%)**	***n* (%)**
Asymptomatic	76 (34.5%)	14 (16.7%)
Symptomatic non-dependent	128 (58.2%)	58 (69.0%)
At risk for exercise dependence	16 (7.3%)	12 (14.3%)

Note. Exercise dependence categories (i.e., asymptomatic, symptomatic non-dependent, and at risk for exercise dependence) were defined using the modified cut-off scores of Exercise Addiction Inventory (Mónok et al., 2012).

4.3.5.2.4 Eating disorders

The prevalence of the likely cases of eating disorders among steroid non-users was 10% (n = 22) and 4.8% (n = 4) among lifetime steroid users. Results of the Chi-square test did not indicate this significant association between lifetime steroid use and eating disorders, $\chi^2_{(1)} = 2.133$, $p = .144$.

4.3.5.2.5 Psychological correlates

The results of the examination of the supposed psychological correlates of AAS use indicated that neither trait anxiety, $F_{(2)} = 0.544$, $p = .581$, nor self-esteem, $F_{(2)} = 0.581$, $p = .560$, had significant association with AAS use. However, current steroid users had the lowest level of self-efficacy comparing to past steroid users and non-users, $F_{(2)} =$

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4.031, p = .019. Eating disorder related psychopathological variables did not show any significant relationship with AAS use, except the interpersonal distrust. Namely, current steroid users displayed higher level of interpersonal distrust relative to the past steroid users and non-users, $H_{(2)} = 9.916$, p = .007.

Table 20

One-way ANOVA for the comparison of anthropometric data, age, and psychological correlates of steroid non-users, past and current steroid users

Variable	Steroid non-users (n = 220)	Past steroid users (n = 53)	Current steroid users (n = 31)	η^2	Test statistic
	***M* (*SD*) [95% CI]**	***M* (*SD*) [95% CI]**	***M* (*SD*) [95% CI]**		
Age	27.7 (7.62) [26.7, 28.7]	27.6 (7.42) [25.6, 29.7]	29.0 (5.67) [26.9, 31.0]	.003	$F_{(2)} = 0.421$
BMI	26.7 (3.96)[c] [26.1, 27.2]	27.3 (3.41)[c] [26.3, 28.2]	30.1 (4.75)[a,b] [28.4, 31.9]	.065	$F_{(2)} = 10.383$***
Desired BMI	27.4 (3.34)[b,c] [26.9, 27.8]	29.0 (3.83)[a,c] [27.9, 30.1]	31.6 (5.12)[a,b] [29.8, 33.5]	.120	$W_{(2)} = 12.922$***
Weight dissatisfaction (kg)	2.3 (9.99)[b] [1.0, 3.7]	5.6 (10.20)[a] [2.8, 8.4]	5.0 (7.75) [2.2, 7.9]	.020	$F_{(2)} = 3.025^{+}$
Bodybuilding Dependence (MASS)	12.7 (4.56)[b,c] [12.1, 13.3]	14.2 (4.52)[a,c] [12.9, 15.4]	16.2 (4.19)[a,b] [14.7, 17.8]	.059	$F_{(2)} = 9.395$***
Muscle Checking (MASS)	7.8 (3.63)[c] [7.4, 8.3]	9.1 (4.40) [7.8, 10.3]	10.5 (3.67)[a] [9.2, 11.9]	.051	$H_{(2)} = 15.623$***
Substance Use (MASS)	7.4 (3.56)[b,c] [6.9, 7.8]	10.2 (4.30)[a,c] [9.0, 11.4]	14.3 (3.49)[a,b] [13.0, 15.5]	.263	$rW3_{(2)} = 80.926$***
Injury Risk (MASS)	9.0 (3.51)[b,c] [8.5, 9.4]	10.3 (3.06)[a] [9.5, 11.2]	11.2 (2.61)[a] [10.2, 12.2]	.053	$H_{(2)} = 14.980$***
Muscle Satisfaction (MASS)	9.3 (2.80) [8.9, 9.7]	9.1 (2.35) [8.5, 9.8]	9.3 (2.27) [8.5, 10.2]	.001	$W_{(2)} = 0.136$
MASS total	46.2 (12.31)[b,c] [44.6, 47.8]	52.9 (13.74)[a,c] [49.1, 56.7]	61.5 (11.06)[a,b] [57.5, 65.6]	.137	$F_{(2)} = 23.974$***
Exercise Dependence (EAI)	15.8 (5.07)[b,c] [15.1, 16.4]	17.8 (4.03)[a] [16.7, 18.9]	19.4 (5.41)[a] [17.4, 21.3]	.059	$F_{(2)} = 9.389$***
Self-Esteem (RSES)	30.4 (3.98) [29.9, 31.0]	30.1 (3.99) [29.0, 31.2]	29.7 (3.44) [28.4, 30.9]	.004	$F_{(2)} = 0.581$

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Trait Anxiety (STAI)	39.8 (8.81) [38.6, 40.9]	40.1 (8.45) [37.8, 42.4]	41.5 (7.29) [38.8, 44.2]	.004	$F_{(2)} = 0.544$
Self-Efficacy (GSES)	30.8 (4.31)[c] [30.2, 31.4]	30.6 (3.95)[c] [29.5, 31.7]	28.5 (4.11)[a,b] [27.0, 30.0]	.026	$F_{(2)} = 4.031$*
Drive for Thinness (EDI)	2.6 (3.27) [2.1, 3.0]	2.2 (2.97) [1.4, 3.0]	2.0 (2.17) [1.2, 2.8]	.004	$H_{(2)} = 0.107$
Interoceptive Awareness (EDI)	1.3 (2.40) [0.9, 1.6]	1.4 (2.15) [0.8, 2.0]	1.4 (1.76) [0.7, 2.0]	.001	$H_{(2)} = 2.249$
Perfectionism (EDI)	4.3 (3.70) [3.8, 4.8]	4.4 (3.40) [3.4, 5.3]	5.7 (3.86) [4.3, 7.1]	.013	$H_{(2)} = 4.288$
Interpersonal Distrust (EDI)	2.3 (2.83)[c] [1.9, 2.6]	2.4 (2.39)[c] [1.7, 3.1]	4.9 (4.61)[a,b] [3.2, 6.6]	.065	$H_{(2)} = 9.916$**

Note. CI = confidence interval. η^2 is a measure of effect size for use in ANOVA with .02 representing small, .05 medium, and .08 large effect sizes. Superscripts indicate significant ($p < .05$) group differences during post-hoc tests.
Weight dissatisfaction was counted as the actual body weight minus the desired body weight.
[a] Significant difference between steroid non-users and other groups.
[b] Significant difference between past steroid users and other groups.
[c] Significant difference between current steroid users and other groups.
[+] p < .10. * $p < .05$. ** $p < .01$. *** $p < .001$.

4.3.5 Examination of the risk factors of lifetime anabolic-androgenic steroid use

Twenty-eight percent ($n = 84$) of the participants reported lifetime AAS use. To identify the risk factors of lifetime AAS use among male weightlifters, binary logistic regression analysis was performed. The variables which proved to be significant during the one-way ANOVA for the comparison of psychological correlates of steroid non-users, past- and current steroid users were used in the model, adjusted to age and level of education. Table 21 provides the predictor variables of lifetime steroid use that were tested in the model. Considering the strong linear relationship between BMI and desired BMI, $r = .71$, $p < .001$, the weight dissatisfaction variable (calculated as desired body weight minus actual body weight) was used in the model instead of the desired BMI. As presented in Table 21, the positive attitude and the willingness to try AAS and other potentially risky supplements to gain muscle mass (measured by the Substance Use subscale of the MASS) significantly increased the odds for AAS use, OR = 1.24, $p < .001$. Higher BMI was also identified as a significant predictor of lifetime AAS use, OR = 1.09, $p = .039$. Finally, the level of education also emerged as a significant predictor of lifetime AAS use. Namely, those weightlifters whose level of education was at most

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high school graduate had more than twofold odds to use AAS, OR = 2.33, $p = .025$, than those whose highest level of education was college graduate or more. The explained variance of the model is 33%.

Table 21

Explanatory variables of lifetime anabolic-androgenic steroid use (binary logistic regression analysis)

Predictor variables	**OR**	**95% CI for OR**
Bodybuilding dependence (MASS)	0.97	[0.88, 1.07]
Muscle checking (MASS)	0.99	[0.90, 1.08]
Substance use (MASS)	1.24***	[1.14, 1.35]
Injury risk (MASS)	1.02	[0.91, 1.14]
Exercise dependence	1.03	[0.95, 1.12]
BMI	1.09*	[1.00, 1.19]
Weight dissatisfaction	1.03	[0.99, 1.07]
Self-efficacy	0.97	[0.90, 1.05]
Interpersonal distrust (EDI)	1.03	[0.93, 1.13]
Age	1.03	[0.98, 1.07]
Level of education[a]	2.33*	[1.11, 4.87]
Nagelkerke R^2	**33%**	

Note: R^2 means explained variance. OR = odds ratio; CI = confidence interval.
Level of education[a]: the level of education was dichotomized, where 1 = level of education was at most high school graduate and 0 = level of education was college graduate or more.
* $p < .05$. *** $p < .001$.

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5. DISCUSSION

5.1 Examination of muscle dysmorphia in male weightlifters and university students

The preliminary study intented to explore the potential usability of the MASS in Hungary. Results indicated that the translated Hungarian version of the MASS demonstrates initial cultural appropriateness and reliability when used with independent samples of Hungarian male weightlifters (n = 60) and university students (n = 60). The study showed each subscale of the instrument to have a satisfactory level of internal consistency. According to our knowledge this was the first Hungarian study that used the MASS, a specific measure for the assessment of MD symptoms (Babusa & Túry, 2012).

The study examined MD symptoms, associated features of body image, and eating disorder related psychopathological characteristics in male weightlifters and university students. Results showed that weightlifters had a higher tendency towards MD symptoms, and displayed more eating disorder related psychopathological characteristics, compared to the undergraduate group. Their attitudes towards their body image also differed.

The symptoms of MD were related to steroid use, since current self-reported steroid users displayed higher tendency for MD symptoms than self-reported steroid nonusers. This result is in line with with previous data (Kanayama et al., 2006; Cole et al., 2003; Rohman, 2009). Furthermore, MD was associated with current weightlifting activity, higher ideal body weight and eating disorder related psychopathological characteristics, i.e. interoceptive awareness. Participating in sports that requires high muscle mass, such as weightlifting or bodybuilding, apparently increases the risk of MD. Moreover, individuals who participate in such sports are more likely to use anabolic steroids (Irving, Wall, Neumark-Sztainer, & Story, 2002). Anabolic steroids in sufficient doses

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increase body mass and strength (Kadi, Eriksson, Holmner, & Thornell, 1999) and high density body mass could be a precursor for MD (Grieve, 2007). Sport participation with a pressure toward huge muscles, lean body mass and a desire for attaining a certain weight gain may not lead directly to the development of MD, but it can increase the risk for developing the disorder.

To summarize, the preliminary study demonstrated that the Hungarian version of the MASS is reliable, but more rigorous testing of its psychometric properties and applicability is required. Furthermore, the study results highlighted the positive relationship between MD symptoms, eating disorder related psychopathological characteristics, and steroid use. These results suggest the idea that MD and body image related concerns among males may not be strictly confined to the Western cultures and their body ideals. Recently, there is an increased expectation towards men's body and appearance in Hungary as well (Túry & Babusa, 2012). The male body appearance market, the beauty and fitness industry have been increasing –for instance, there are more than 200 fitness clubs in the capital city Budapest. There is also a growing trend for male cosmetics and grooming products. The value of groomed, muscular and lean male body has also risen. The tendency suggests that the male body ideals are similar like that of in Western countries. The question for further research is: Does this tendency manifest in male body image pathologies or remain as a transient "fashion trend"? Where are we now in the progress of assimilation of the Western ideals? The appearance of MD in Hungary may be the same like that of AN and BN. A few decades ago eating disorders were regarded as the consequences of the Western cultural ideals ("3 Ws": white Western women). Now eating disorders are as widespread in Central-East European region as in Western countries (Rathner et al., 1995). However, there are some cultural differences in the morbidity between East and West Europe. Surprisingly, Rathner et al. (1995) found the highest prevalence of bulimic behaviour in Hungary compared to Austria and Germany. The appearance of MD in Hungary might be similar like that of AN and BN. Unfortunately, epidemiological studies on MD are still lacking in Central-East Europe. MD and the muscular ideology might be wide-spread, but still understudied phenomenon in the Central-Eastern European countries.

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5.2 Adaptation of the Muscle Appearance Satisfaction Scale in Hungary

The purpose of the second study was the psychometric evaluation of the Hungarian version of the MASS. Considering that little work has been done on the examination of the factor structure of the MASS and MD symptomatology outside of the U.S., we investigated the psychometric properties of the Hungarian version of the MASS and MD symptomatology among Hungarian male weightlifters and undergraduate students.

In the weightlifter sample, we replicated the original five-factor structure (Mayville et al., 2002), with one item exception. The self-worth item (Bodybuilding Dependence factor, item 15) did not have any salient factor loadings, so we suggest excluding this item from the Hungarian version of the MASS. However, in the undergraduate sample, we found a three-factor solution instead of the original five factors. Besides the original Muscle Satisfaction factor, the items referring to Bodybuilding Dependence and Injury Risk were represented in one factor, and the items referring to Muscle Checking and Substance Use were represented in the third factor. These results suggest that the Hungarian version of the MASS can be adequately used among male weightlifters, but it works somehow differently among non-weightlifters. These findings correspond with previous research showing that the MASS has different factorial structure in the weightlifters and in the general population. Originally, the MASS was developed on male weightlifter samples and showed a stable five-factor structure (Mayville et al., 2002). Nevertheless, a recent study conducted among Irish and British men suggested a unidimensional six-item version of the MASS in the general population (Ryan & Morrison, 2010).

Scale score reliability and test-retest reliability of the MASS were also supported. In the weightlifter group, the aspects of MD were associated with low self-esteem, food supplementation, current steroid use, fewer years of exercise, younger age, and lower BMI. The drive for thinness was not linked with the aspects of MD, suggesting a

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difference between these two constructs and supporting the discriminant validity of the MASS. Our results support previous research studies demonstrating the relationship between low self-esteem and muscle dissatisfaction (McCreary, 2007; Olivardia et al., 2004). A number of studies have pointed out the importance of being muscular in males (e.g. Fisher et al., 2002; Jacobi & Cash, 1994; Pope, Phillips, et al., 2000). One of the reasons why muscularity is so important to men is that it is associated with masculinity (Weinke, 1998). This implies that the more muscular a man is, the more masculine he perceives himself to be. Those men whose self-esteem is dependent upon their appearance may engage in appearance-improving behaviors (Crocker, 2002). These behaviors can be excessive exercise, rigid diet, or weightlifting/bodybuilding activity. The relationship between low self-esteem and MD is also well-documented (Grieve, 2007; Grieve & Helmick, 2008; Lantz et al., 2001; Pope, Phillips, et al., 2000).

In agreement with previous studies, we found that anabolic steroid use and food supplementation were associated with MD, as men with MD symptoms were more likely to use these substances to increase muscle mass (Kanayama et al., 2006; Olivardia et al., 2000; Pope & Katz, 1994). The relationship between fewer years of exercise and muscle satisfaction may seem odd, given that men with MD exercise excessively; however, the results also indicated the association between younger age and MD. Considering this, in younger individuals, fewer years have been spent exercising. The latter finding is in accordance with previous study results which reported that the age of onset of MD was in early adulthood (Cafri et al., 2008; Olivardia et al., 2000). Finally, lower BMI was only weakly associated with one aspect of MD, namely injury risk. Although the BMI is included in the conceptual model of MD, it has also been noted that the relationship between BMI and MD has not been established yet (Grieve, 2007). Moreover, the interpretation of BMI has to be treated carefully in this respect, as high BMI may indicate either a high level of muscle mass or a high level of body fat, and lower BMI may also indicate lean musculature. Therefore, the use of the "fat-free mass index" (FFMI; Kouri et al., 1995) as an objective measure of an individual's degree of muscularity would be more appropriate in future studies.

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In the undergraduates, aspects of MD were associated with low self-esteem, low drive for thinness, and current weightlifting activity. The relationship between low self-esteem and MD in the undergraduate sample indicates that muscular appearance and muscle satisfaction may have a general role in self-esteem among males. The weak association between low drive for thinness and MD may indicate that males with greater MD symptoms have also a desire to increase muscle mass. However, further examination is necessary to clarify the relationship, since a previous study also pointed out the relationship between MD and the drive for thinness (Olivardia, 2001). The present subscale of the EDI also refers to the drive for leanness, which partially explains the relationship with MD. Different sample composition and possibly the different exercise motivations, e.g., weight loss or weight control in the undergraduate group may serve another explanation. Finally, weightlifting activity was associated with MD, and those undergraduates with weightlifting activity displayed greater MD symptoms. The conceptual model of MD also highlighted that participation in those sports which focus on muscular appearance and muscle gain, e.g., weightlifting or bodybuilding increases the risk for developing MD (Grieve, 2007).

To summarize, our study provided two main results. First, the construct validity and reliability of the Hungarian version of the Muscle Appearance Satisfaction Scale (MASS-HU) were supported in the weightlifter sample. Based on the psychometric examination of the MASS-HU, symptoms of MD can be measured with the five-factor, 18-item Hungarian version of the MASS among male weightlifters. We hope that the MASS-HU will encourage and stimulate further research and clinical work in the field of MD in Hungary. Second, our study results also confirmed previous findings demonstrating the relationship between low self-esteem and muscle dissatisfaction among males. The current study is in line with a previous study (Túry et al., 2001), pointed out that the muscle dissatisfaction and the muscular ideal seem to be frequent phenomena not only in the U.S. and western countries, but also in Hungary.

The study has limitations that are important to acknowledge. First, the main limitation of the present study is the use of convenience sampling. Second, as self-report measures were used in the study, there was no objective measure of anthropometric data. Third,

the direction of causal relationships remained uncertain during the analyses. The main purpose was to test the associations between the factors of the MASS and other variables; thus we did not distinguish the antecedents and consequences. Future research with a prospective study design could clarify the nature of these associations. It would also be important to examine whether the impact of antecedent variables such as age, BMI, and self-esteem on steroid use, for example, is mediated by muscle appearance satisfaction. Fourth, we did not use sexual orientation measures; sexual orientation is often associated with body image dissatisfaction and disordered eating among men (Chaney, 2008; Kaminski, Chapman, Haynes, & Own, 2004; Strong, Williamson, Netemeyer, & Geer, 2000). Finally, the lack of the Hungarian version for MD assessment did not allow for testing the concurrent validity of the MASS. The adaptation of another MD-related questionnaire in Hungary, the Muscle Dysmorphia Inventory (Rhea, Lantz, & Cornelius, 2004), would allow for the examination of the concurrent validity of the measure. Since non-clinical samples were used for the development and validation of the MASS, cut-off scores are not available (Mayville et al., 2002). An assessment of discriminative validity and a definition of cut-off scores with the use of a clinical sample reporting the characteristic symptoms of MD would be beneficial. Such future research could facilitate the use of the MASS as a diagnostic tool.

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5.3 Muscle dysmorphia in Hungarian male weightlifters

5.3.1 Characteristics of Hungarian male weightlifters

In the third study we examined Hungarian male weightlifters and explored the prevalence rate and various psychological characteristics of MD and AAS use within this high risk population. However, it is worth mentioning some general characteristics of the total sample since this is only the second study among male weightlifters in Hungary. Since the previous study was conducted ten years ago (Túry et al., 2001), it is also useful to compare our results with the results of the first Hungarian study to follow time trends. If we compare the anthropometric data of the participants of the previous and the present studies, the differences are notable. Participants in the currents study had the mean age of 27.8 (SD = 7.40) years, which is significantly higher than in the previous study reported by Túry et al. (2001), 26.2 years; $t_{(303)}$=3.800, p < .001. The mean body height of our study sample was 179.5 cm (SD = 6.05), which was significantly lower than the mean body height of the participants in the study of Túry et al. (2001), 180.7 cm, $t_{(304)}$ = 3.391, p = .001. The body weight, BMI, and desired body weight of the male weightlifters in our sample were significantly higher compared to the study results of Túry et al. (2001). Ten years ago the body weight of the male weightlifters was 83.2 kg and their BMI was 25.5. By 2011 their body weight increased to 87.5 kg and their BMI to 27.1, $t_{(303)}$ = 5.176, p < .001 and $t_{(303)}$ = 6.955, p < .001, respectively. Weightlifters in 2001 reported a desired body weight of 87.2 kg. Despite of the higher body weight of the weightlifters in 2011, they still would like to increase their body weight and reported a desired body weight of 90.7 kg, $t_{(303)}$ = 4,213, p < .001. The difference of the means between the actual and desired body weight of the participants in the previous (4 kg) and present study (3.2 kg) did not differ significantly, $t_{(303)}$= 1.455, p = .147.

More interestingly, the number of males who are dissatisfied with their body weight significantly increased in this population. In 2001, 43% of the male weightlifters were satisfied with their body weight; however in 2011 only 9.5% of the participants reported weight satisfaction, $\chi^2_{(2)}$ = 144.461, p < .001. Conversely, the number of those males

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who wanted to lose or gain some weight increased from 2001 to 2011. In 2001, only 16% of the weightlifter males wanted to lose some weight; by 2011 this number raised to 31%. Ten years ago the number of weightlifter males who wanted to gain weight was 41%; by 2011 this number increased to 60%. Moreover, in the study of Túry et al. (2001) only 4.3% of the male weightlifters wanted to achieve notable weight gain (at least 5 kg); in the present study we found significantly higher rate, since almost half of the participants (48.4%) reported a desire to gain notable weight, $\chi^2_{(1)} = 1433.801$, $p < .001$.

These results are in line with previous international studies suggesting increasing body dissatisfaction among males over the last few decades (Berscheid et al., 1973; Cash et al., 1986; Garner, 1997; Grieve et al., 2006; Mishkind et al., 1986; Pope, Phillips, et al., 2000; Vartanian et al., 2001). The populations in the present and the previous studies are consisted of male weightlifters, therefore results should not be generalized to the general Hungarian male population. Nevertheless, our results comparing to the previous results highlight the changing trends in male body image concerns and body size ideals. Considering that we examined these trends ten years after, the changes are dramatic.

Several studies pointed out the prevalence of exercise dependence among weightlifters (Hale et al., 2010; Hurst et al., 2000; Smith et al., 1998; Smith & Hale, 2004). In the present study we also examined the prevalence rate of exercise dependence among Hungarian male weightlifters. According to the results, 9.2% of the male weightlifters were at risk for exercise dependence and further 61.2% were symptomatic non-dependent. In a recent Hungarian study, the prevalence rate of exercise dependence categories in exercising population were: 44.8% asymptomatic, 52.0% nondependent symptomatic exercisers, and 3.2% at risk for exercise dependence (Mónok et al., 2012). Results indicated that the prevalence rate of exercise dependence was significantly higher in the present sample of male weightlifters compared to the result of the above-mentioned study, $\chi^2_{(2)} = 54.918$, $p < .001$. However, the prevalence rates in our study were significantly lower compared to the international prevalence rates. Hale et al. (2010) examined the prevalence rate of exercise dependence among male weightlifters and power lifters. According to the results 15.1% ($n = 22$) of the participants were

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identified as at risk for exercise dependence, 77.4% (n = 113) as symptomatic non-dependent, and 7.5% (n = 11) as nondependent asymptomatic. The prevalence rate of exercise dependence (both 'at risk' and 'symptomatic non-dependent') in the study of Hale et al. (2010) was significantly higher compared to the prevalence rate in our study population (based on both the new cut-off scores suggested by Mónok et al. (2012): $\chi^2_{(1)}$ = 215.374, p < .001; and the original cut-off score: $\chi^2_{(1)}$ = 99.757, p < .001. Lejoyeux et al. (2008) found 42% (n = 125 out of 300) prevalence rate of exercise dependence among clients of a fitness room. This prevalence rate is also significantly higher compared to our results, $\chi^2_{(1)}$ = 134.173, p < .001.

Research evidence also suggests that weightlifters are at increased risk for developing an eating disorder (Anderson et al., 1995; Goldfield et al., 1998; Mangweth et al., 2001). In our sample of male weightlifters, 8.5% was likely to have an eating disorder (AN or BN). Since 31% of the participants would like to lose weight and 60% would like to gain weight, the presence of eating disorder symptoms in this sample of male weightlifter is not surprising. Furthermore, they also have an increased preoccupation with their body image, food and exercise, which may also increase the risk for developing eating disorder symptoms (Mangweth et al., 2001).

5.3.2 Prevalence of muscle dysmorphia among Hungarian male weightlifters

The first purpose of the study was to identify a group of male weightlifters with unique features of MD, which can be distinctive from non-muscle dysmorphic weightlifters and to set out a prevalence rate of MD among Hungarian male weightlifters. Study results differentiated three groups (normal weightlifters, low risk MD group, and high risk MD group) of male weightlifters, instead of two (MD and non-MD group of weightlifters). This result was not surprising, as Hildenbrandt et al. (2006) identified five groups (muscle dysmorphic, muscle concerned, fat concerned, normal behavioral, and normal) within their sample of male weightlifters with the use of the same statistical method (LCA). In the present study we were able to identify a group of weightlifters who displayed the characteristics of MD, called the high risk MD group. Although, this group was not a clinically diagnosed group with MD, they displayed the symptoms of MD conceptualized by Thompson et al. (1999) and fulfilled the diagnostic criteria of

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MD described by Pope et al. (1997). Based on these characteristics, the high risk MD group was distinctive from the other two groups of male weightlifters. According to the results of the latent class analysis, the estimated prevalence rate of MD was 18.0% (n = 55) in this sample of male weightlifters (in the study we referred them as high risk MD group). A further 51.6% (n = 157) displayed elevated levels of MD symptoms; thus, these male weightlifters could be characterized as the low risk MD group. Future research should focus on the at-risk groups and analyze the potential risk factors of MD. Finally, 30.2% (n = 92) of the participants could be described as normal weightlifters as they did not show the symptoms of MD.

There is only one study available in Hungary that can be comparative to our study results. In this previous Hungarian study Túry et al. (2001) found significantly lower prevalence rate of MD (4.3%) among male weightlifters using interview technique, $\chi^2_{(1)}$ = 140.525, p < .001. However, the prevalence rate of MD in this study is significantly higher compared to the 8.3% prevalence rate reported by Pope et al. (1993), $\chi^2_{(1)}$ = 38.298, p < .001, and the 10% prevalence rate found by Pope & Katz (1994), $\chi^2_{(1)}$ = 22.118, p < .001. The comparison of our results with other studies is difficult as the findings in different studies are heterogeneous in terms of the study sample (e.g., weightlifters, bodybuilders, power lifters, men with body dysmorhic disorder), study design (e.g., questionnaire or interview based), and outcome measures (several measures of MD symptoms are available). Since the prevalence rate in the present study is a questionnaire based one, and the differentiation of the MD group based on a specific statistical method, we suggest this rate as a tentative prevalence rate. Although Hildenbrandt et al. (2006) found similarly high prevalence rate (16.9%) among male weightlifters, with the use of LCA, $\chi^2_{(1)}$ = .308, p = .579. Some authors also noted that the prevalence rate of MD is underestimated and many men might suffer from subclinical forms of MD even in the general population (Goodale et al., 2001; Olivardia, 2001; Pope, Phillips, et al., 2000), results should be treated carefully.

Since our study sample was a special population consisted of male weightlifters, the generalization of the results is restricted to the male weightlifter population and can not be extended to the general population. Despite of the limitations, the present study is the

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first national study assessing the prevalence of MD in high risk population of male weightlifters with a larger sample size. Although studies relating to MD in Central-Eastern European region are still lacking, our results suggest that MD is prevalent in Hungarian male weightlifters.

5.3.3 Determination of the tentative cut-off score of the Muscle Appearance Satisfaction Scale

To our knowledge, no cut-off score for the MASS is available; thus, the present study also aimed to determine a tentative cut-off score for the measure. Considering the high risk MD group as a 'gold standard', sensitivity and specificity analyses were performed. According to the results, we proposed a score of 62 as an appropriate cut-off point for the MASS to distinguish between MD and non-MD cases among male weightlifters. Given that we used a nonclinical sample of MD cases, the proposed cut-off score is still a tentative cut point. Additionally, this cut-off score may vary in different research studies and may also depend on culture and other variables. In the future, it would be particularly interesting to examine the proposed cut-off score in other studies. The use of clinical MD sample for this purpose would be highly instructive.

5.3.4 Characteristics and psychological correlates of muscle dysmorphia

The third aim of the study was to explore differences between muscle dysmorphic and non-muscle dysmorphic groups of male weightlifters based on various psychological correlates.

5.3.4.1 Muscle dysmorphia and high level of BMI

The relationship between MD and BMI is still unclear and the results are inconsistent (Cafri et al., 2005). Our study results supported the association between MD and BMI (e.g., Grieve, 2007), as the mean BMI of the MD group was the highest comparing to the low risk MD group and normal weightlifters. Additionally, this BMI was larger than the normal recommended BMI for male adults (20–25). However, BMI is not an adequate measure of obesity in muscular men since it can not distinguish between muscle and fat mass. That is, use of the "fat-free mass index" (FFMI; Kouri et al., 1995) as an objective measure of an individual's degree of muscularity would be more

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appropriate for the measure of male body composition. Although the present study design did not allow the use of the FFMI, we can hypothesize that men with MD had a high level of muscle mass instead of fat mass, since they also reported highest desire toward weight gain instead of weight loss. As the ideal male body is the muscular one, we can assume that they wanted to gain muscle mass instead of fat mass. Moreover, the results of the present study also confirm this assumption, as the subjective importance of muscle mass gain was significantly higher among those who would like to gain weight. MD was also associated with the high desire toward weight gain and body weight dissatisfaction, since the high risk MD group wanted to gain 7 kg more weight in average.

5.3.4.2 Muscle dysmorphia and exercise dependence

Our study results also supported the relationship between MD and exercise dependence, since those males with MD displayed the highest level of exercise addiction. Accordingly, the quantity and frequency of workouts were also the highest in the high risk MD group. Our finding is in line with previous study results emphasizing the relationship between MD and exercise dependence (Hale et al., 2010; Hurst et al., 2000; Smith et al., 1998; Smith & Hale, 2004). These studies pointed out that those individuals who display higher levels of MD may be at higher risk for developing addictive exercise behaviour patterns. Our results also supported the proposed psycho-behavioural model of MD (Lantz et al., 2001), which suggests that exercise dependence is one of the behavioural characteristic related to MD. Hale et al. (2010) found that symptoms of MD also predicted exercise dependence. Obsession with gaining muscle is associated with excessive exercise, as muscular development can be achieved through physical activity.

5.3.4.3 Muscle dysmorphia and anabolic-androgenic steroid use

As it was expected, elevated prevalence rate of AAS use was related with MD, since both current and lifetime use of AAS were more prevalent among males with MD. The lifetime prevalence of AAS use was 68% and still 41% of the participants in this group were current AAS user. These were the highest prevalence rates among the groups and this result is also consistent with the diagnostic criteria of MD (Pope et al., 1997). Of

note, the lifetime prevalence of AAS use was 24% in the low risk MD group, and only 11% in the normal weightlifters. The current AAS use was notably lower in these groups, as 5% of the low risk MD group and only 1% of the normal weightlifters reported current AAS use. The highest frequency of the desire toward weight gain was reported in the high risk MD group, which may partially explain the higher frequency of AAS use in this group.

These results are comparable with previous data; however, some research found even higher prevalence rate of AAS use among males with MD. Pope et al. (1993) revealed that 100% (four out of four) of the men with MD reported lifetime history of AAS use. In a previous study of MD in Hungary, Túry et al. (2001) also found 100% (six out of six) prevalence rate of AAS use among men with MD. The prevalence rate of AAS use among the 140 male bodybuilders was 9.3%. Later studies found lower prevalence rate of AAS use among men with MD. Pope et al. (1997) found that 40% (6 out of 15) of men with MD reported a history of AAS use. Similarly, Olivardia et al. (2000) found that 46% of the men with MD and only 7% of the normal non-MD comparison weightlifters reported AAS use.

The increased prevalence rate of AAS use among men with MD is due to their preoccupation with the idea that their bodies are not sufficiently big and muscular (Cafri et al., 2005; Kanayama et al., 2006; Leit et al., 2002; Olivardia et al., 2000; Pope et al., 1997; Rhea et al., 2004). This body image concern and the desire toward muscle gain often motivate individuals to use AAS. Research suggests that body image dissatisfaction (Brower, 2002) and the pursuit of muscularity (Olivardia et al., 2000), which are two main characteristics of MD, can increase the risk of AAS use and dependence. Rohman (2009) argued that the frequent AAS use in men with MD is in relation with their body image disorders that hinder them to realize their muscular development. Brower (2002) suggested that muscularity becomes central to the self-esteem of men with MD and any loss of muscularity evokes anxiety, which often lead to AAS dependence. In our study sample the frequency of supplement use was also the highest (86.7%) in the high risk MD group comparing to the low risk MD group

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(66.8%) and normal weightlifters (50.4%). This result also suggests that the body appearance control was the highest in the high risk MD group.

5.3.4.4 Muscle dysmorphia and eating disorder related psychopathological characteristics

Results indicated that men with MD displayed more eating disorder related psychopathological characteristics, as they reported higher levels of drive for thinness and interoceptive awareness relative to the group of normal weightlifters, and had higher levels of perfectionism and interpersonal distrust comparing to the normal weightlifters and low risk MD group. These results correspond to previous study findings that emphasized the association between MD, disordered eating, and eating disorder related characteristics (McFarland & Kaminski, 2009; Mossley, 2009; Olivardia et al., 2001; Pope at al., 1993; Pope et al., 1997; Pope & Katz, 1994). Of note, Olivardia et al. (2001) found similar results, as muscle dysmorphic men had elevated scores on the Eating Disorder Inventory (Garner et al., 1983), that is, they showed perfectionistic traits, maturity fears, feelings of ineffectiveness, and drive for thinness. The etiology of MD may resemble to that of eating disorders, as some behavioral and psychological traits of AN and BN are similar in case of MD.

Significantly higher level of drive for thinness was associated with MD. However this result may be controversial, Olivardia (2001) also pointed out the relationship between MD and the drive for thinness, and he argued that the present subscale of the EDI also refers to the drive for leanness –which is also common in AN. Men with MD may be that obsessed with their percentage of their body fat like women with AN, which partially explains the relationship between MD and drive for thinness. Moreover, Kelley, Neufeld, and Musher-Eizenman (2010) confirmed this relationship as they suggested that both drive for thinness and drive for muscularity can be experienced simultaneously.

The high risk MD group also reported higher levels of interoceptive awareness. This eating disorder related psychopathological characteristic refers to “one's lack of confidence in recognizing and accurately identifying emotions and sensations of hunger

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or satiety" (Garner et al., 1983). This eating disorder related characteristic may lead to the development of either binge eating or BN which is common in MD (McFarland & Kaminski, 2009; Olivardia et al., 2001; Pope et al., 1997). Moreover, the strict dietary regimens, the use of ergogenics and food supplements may also distract their sensations of hunger and satiety. Furthermore, this kind of lack of confidence may also contribute to the development of body monitoring and body obsessions.

Perfectionism was also related to MD. Perfectionism is defined as the pursuit of unrealistic goals (Nugent, 2000, cited by Grieve, 2007). In the conceptual model of MD (Grieve, 2007) perfectionism influences the development of MD. Research evidence shows that eating disordered women have unattainable body shape goals and higher levels of perfectionism than women without eating disorders (Vohs et al., 2001). Men with MD also have unrealistic body shape goals, thus it is hypothesized that perfectionism may also influence the development of MD. Kuennen and Waldron (2007) supported this hypothesis as they found a direct relationship between perfectionism and MD. Our study results also confirm the association between MD and perfectionism, indicating that men with MD are prone to pursue a perfect and unattainable muscular body ideal. The results also support this hypothesis, as even though the high risk MD group had the highest BMI, they also reported the highest levels of desire toward weight gain comparing to the low risk MD group and normal weightlifters. Moreover, as it was mentioned before, those males who wanted to gain weight reported the highest level of importance of muscle mass gain.

MD was also associated with higher levels of interpersonal distrust. This association is possibly due to their impaired social and intimate relationships. Often, MD is socially and occupationally impairing and those who are affected usually avoid social activities and people (Cafri et al., 2008; Kovács & Túry, 2001; Olivardia, 2001; Pope et al., 1993; Pope et al., 1997). This might be because of they believe that their bodies are not sufficiently lean and muscular, and being afraid of humiliations relating to their perceived body deficiencies. As a result of their imagined body flaws –which is also a characteristic of body dysmorphic disorder– they avoid those situations where their bodies are exposed to others. Thus, they hide their bodies and wear loose and heavy

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clothes even in the summer. This characteristic of MD may lead to the elevated scores of interpersonal distrust.

Although we did not assess childhood victimization, some authors emphasized that childhood bullying experiences may also contribute to the development of MD. Some study results pointed out that those boys who suffered from childhood physical victimization by peers and parents –because of being physically weak– are more likely to engage in bodybuilding activity (Fussel, 1991; Klein, 1993). The assumption that childhood bullying experiences are strongly associated with the development of MD was supported by the study of Wolke and Sapouna (2008). Their study results showed that those weightlifters who were subjected to childhood bullying experiences displayed more MD symptoms. This kind of negative childhood experience may also contribute to the development of interpersonal distrust. Moreover, weightlifting is not a team sport that requires social interactions and can be performed even alone. Furthermore, Wolke and Sapouna (2008) also emphasized that MD and impaired psychosocial functioning are often related; thus, clinicians should be aware of this association.

To summarize, our results highlighted the association between eating disorder related psychopathological characteristics and MD. Several studies pointed out that males with MD are at increased risk for developing eating disorders (McFarland & Kaminski, 2009; Mossley, 2009; Olivardia et al., 2001; Pope at al., 1993; Pope et al., 1997; Pope & Katz, 1994). The rigid adherence to a dietary regimen, the weight control behaviours, such as following a special diet, eating in every three hour even if not hungry, the use of food supplements, and the preoccupation with food contribute to the development of an eating disorder (Goldfield et al., 1998). These results showed that some underlying characteristics of men with MD are similar to that of patients with eating disorders, which may predispose them to the development of a full-blown eating disorder.

Besides the eating disorder related psychopathological characteristics, we also examined the relationship between MD and eating disorders. This association is well-established in the literature (McFarland & Kaminski, 2009; Olivardia et al., 2000; Pope et al., 1993; Pope & Katz, 1994; Pope et al., 1997). Although, the prevalence of eating disorders in

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the high risk MD group and low risk MD group was higher (10.9% and 9.5%, respectively) compared to the normal weightlifters (5.4%), we did not find significant association between MD and eating disorders. It can be that we did not apply the appropriate measure for the assessment of eating disorders, as we used the SCOFF questionnaire. This screening tool has been developed to raise the suspicion of a likely case of an eating disorder and has not been designed to be used as a diagnostic tool. Therefore, the assessment of eating disorders should be planned due foresight. Further studies should consider the use of other scales to reveal the association between MD and eating disorders in Hungarian risk populations.

5.3.4.5 Muscle dysmorphia and low level of self-esteem

Our study results confirm previous findings since MD was associated with lower level of global self-esteem in the present study of male weightlifters. The proposed etiological models of MD (Grieve, 2007; Lantz et al., 2001) and the model of body change strategies (Cafri et al., 2005) involved low self-esteem as a contributing factor to the development of the disorder. Besides this, many studies suggested negative relationship between self-esteem and MD symptoms (Grieve & Helmick, 2008; Lantz, Rhea, & Mayhew, 2001; Pope, Phillips, et al., 2000; Wolke & Sapouna, 2008). Some aspects of the relationship between MD and low self-esteem already has been described in Study 2; thus, only additional issues will be discussed in the present section.

Ebbeck, Watkins, Concepcion, Cardinal, and Hammermeister (2009) found that those who are suffering from low self-esteem use weightlifting as a coping mechanism for the improvement of muscularity. This activity is appreciated by the society and may also enhance self-efficacy; therefore motivates for more exercise. Another explanation can be that muscularity becomes the center of self-esteem of males with MD. Due to their body image disorder and body dissatisfaction, they have a negative view of their muscularity which is the center of their self-esteem; therefore, they engage in excessive exercise to increase their muscle mass. This idea is also supported by Crocker (2002), emphasizing that those men whose self-esteem is dependent upon their appearance may engage in appearance-improving behaviours in order to enhance their self-esteem. When self-esteem and masculinity are solely based on musculature, this may lead to the

development of MD. Further studies should examine the mediator factors between MD and low self-esteem.

5.3.4.6 Muscle dysmorphia and anxiety

Many studies found a relationship between MD, general anxiety, and anxiety disorders (Cafri et al., 2008; Chandler et al., 2009; McFarland & Kaminski, 2009; Olivardia et al., 2000; Wolke & Sapouna, 2008). Our study results correspond with previous research findings as MD was associated with higher levels of anxiety. However, the source of anxiety in men with MD is not clear, as it may relate to several different factors, such as body appearance, obsessive thoughts, body comparison, low self-esteem, or feelings of not being muscular or masculine enough. Furthermore, we still do not know whether the onset of anxiety occurs before or after the development of MD. Olivardia et al. (2000) suggested that compulsive weightlifting might serve as a coping strategy to deal with the comorbid conditions, such as feelings of anxiety. Wolke and Sapouna (2008) found that higher levels of MD symptoms partially mediated the relationship between childhood victimization and global psychopathology, including anxiety. Despite of these study findings, the relationship between MD and anxiety is still understudied. Future studies for the clarification of the sources of anxiety experienced in MD, should investigate the mediator and moderator factors between MD and anxiety.

5.3.5 Prevalence of anabolic-androgenic steroid use among Hungarian male weightlifters

Although research evidence indicates that the use of AAS is prevalent among male weightlifters, the AAS use in this high risk population is still understudied in Hungary. Therefore, the study also aimed to examine the prevalence rate of AAS use among Hungarian male weightlifters. Results indicated that the lifetime prevalence of AAS use in our study sample of Hungarian male weightlifters was 27.6%. Moreover, past and current steroid use was also differentiated in the study. According to the results, 17.4% of the weightlifters reported past steroid use and 10.2% reported current steroid use.

In a previous comparable Hungarian study, 9.3% (n = 13) of the male weightlifters reported current steroid use (Túry et al., 2001), which was similar to the prevalence of

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current steroid use in the present study, $\chi^2_{(1)} = .290$, $p = .590$. Pope et al. (2012) found 44% (n = 102) prevalence of lifetime AAS use among male weightlifters. The prevalence rate of lifetime steroid use in the current study was significantly lower comparing to results of the above mentioned study, $\chi^2_{(1)} = 33.056$, $p < .001$. Pope et al. (1993) found 51% (n = 47) and Kanayama et al. (2003) also revealed same (50%, n = 48) prevalence rate of lifetime AAS use among male weightlifters. These rates were also significantly higher compared to the prevalence rate in our study sample, $\chi^2_{(1)} = 66.430$, $p < .001$ and $\chi^2_{(1)} = 60.842$, $p < .001$, respectively. However, the prevalence rate of lifetime AAS use in the current study is lower compared to the international data, the current study results indicate that lifetime AAS use among Hungarian male weightlifters is also prevalent. As it was suggested in previous studies (e.g., Thiblin & Petersson, 2005), the weightlifter population is considered as a high risk population for AAS use. Further national studies would be needed to confirm this hypothesis and also to replicate our research findings.

5.3.6 Characteristics of anabolic-androgenic steroid users

Since AAS use is a growing public health problem, many studies investigated the association between AAS use and various psychological correlates to find out the risk factors of AAS use. Therefore, we also aimed to examine the general and psychological characteristics of AAS users that may predispose weightlifters to AAS use. In the present study current and past AAS users were distinguished, since the psychological correlates may be different in these two groups.

Results indicated that current steroid users had higher BMI than past steroid users and non-users. Because of the anabolic effect of AAS, the higher level of BMI in the current steroid users is not surprising, as the use of AAS improve fat-free mass, muscle size, and strength (Bhasin, et al., 1996; Kouri et al., 1995). Additionally, in the previous study of Hungarian male weightlifters, the body weight, BMI, and desired body weight of steroid users were significantly higher compared to steroid non-users (Túry et al., 2001).

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Our study results confirm previous research findings, as current steroid use was strongly associated with the symptoms of MD. Although at a lesser extent, this association was present in past steroid users as well. Therefore, our study results are in line with previous study results suggesting that AAS users display marked symptoms of MD (Cole et al., 2003; Kanayama et al., 2003; Kanayama et al., 2006; Pope et al., 1997; Rohman, 2009). The association between AAS use and MD had been discussed earlier.

Results also indicated higher levels of exercise dependence in lifetime steroid users comparing to the non-users. Since muscle hypertrophy usually occurs through physical activity, it is expected that AAS use is related to excessive exercise. Furthermore, the prevalence rate of exercise dependence was significantly higher in lifetime steroid users (14.3%, n = 12) compared to steroid non-users (7.3%, n = 16). However, it should be also noted that excessive exercise may impede muscle growth since the muscles need proper rest and recovery after a hard workout in order to hypertrophy. Excessive amount of exercise and short recovery periods may interfere with muscle gain (Eichner, 1995).

Results also revealed that current steroid users had the lowest level of self-efficacy comparing to past steroid users and non-users. Self-efficacy reflects to the belief that one's action are responsible for successful outcomes; in other words, it refers to the beliefs that a person can achieve something on their own, based on his own power (Bandura, 1994). People with low self-efficacy believe that they need help from outside to achieve their goals. Based on this, those weightlifters who would like to build muscles and increase their strength with low self-efficacy may start using AAS. Usually these people believe that they can not achieve their body ideals without AAS and other muscle-enhancing supplements. Therefore, intervention and prevention programs should also focus on and include self-efficacy as it may play an important role in the development of AAS use.

Finally, current steroid users displayed the highest level of interpersonal distrust relative to the past steroid users and non-users. This result is in line with previous study results, suggesting an increased level of interpersonal distrust among AAS users (Cole et al., 2003; Goldfield & Woodside, 2009; Kanayama et al., 2006). Steroids may induce

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changes in the personality and behaviour, which can have an adverse effect on the interpersonal relationships as well. On the other hand, the phenomenology of MD and exercise dependence, which are strongly associated with AAS use, may also have an effect on personality and interpersonal relationships.

We were unable to confirm previous study results, emphasizing the relationship between low self-esteem and AAS use (Brower et al., 1994; Cafri et al., 2005; Blouin & Goldfield, 1995). This negative result suggests that AAS use may not be strictly related to low self-esteem (as it was also argued by Kanayama et al., 2006), but rather to the feelings of ineffectiveness and the desire toward weight gain.

5.3.7 Risk factors of anabolic-androgenic steroid use

Since AAS use has many adverse health effects and presumably has different risk factors like that of MD, we sought to identify risk factors associated with AAS use. Not surprisingly, results showed that the positive attitude and the willingness to try AAS and other substances to increase muscle mass were significant predictors of lifetime AAS use. Those people who have positive attitudes toward their own and others' use of steroids and other supplements or even consider taking AAS and neglecting the harmfulness of these substances have a higher risk of lifetime AAS use. Thus, prevention programs should also focus on the change of attitudes and perceptions about AAS and other, potentially risky substances besides the educational part about the adverse effects of AAS use. Many steroid prevention programs had been developed for adolescents. For instance, "The Adolescents Training and Learning to Avoid Steroids" (ATLAS) program has a team-oriented educational approach that motivates and empowers student athletes to make the right choices about steroid use (Goldberg et al., 2000). The program was designed to change the attitudes toward AAS use and also to teach refusal skills, which can result in the reduction of intentions to use AAS and other performance-enhancing substances. Evaluation results of the randomized control trials were promising.

According to the results, higher BMI also predicted lifetime AAS use. However, the relationship between BMI and AAS use is still not clear, some studies found association

between lower BMI and AAS use (e.g., Neumark-Sztainer et al., 1999). The proposed model for putative risk factors for body change strategies in males also involved BMI as a potential risk factor that may lead to body change strategies, including AAS use (Cafri et al., 2005). These studies argue that low BMI indicates small body size, thus a desire to gain muscle mass and high BMI suggests high level of body fat and a desire to lose weight. On the contrary, our results suggest that higher BMI can be a potential risk factor for AAS use. Of note, we also have to consider that AAS use greatly improve muscle mass that also increases BMI. Again, the use of an alternative index for the measure of body composition, such as FFMI, would be more appropriate for future study purposes.

Finally, lower level of education (at most high school graduate) proved to be a significant predictor of lifetime AAS use. Study results are mixed in terms of AAS use and educational level, as some found that typical AAS users were highly educated, while others found low educational level among AAS users (Amsterdam et al., 2010). Our results suggest that those males who are less educated have a higher risk of lifetime AAS use. Males with lower level of education may not be aware of the adverse health effects of AAS and may have deficient social and refusal skills; thus, they may be more vulnerable to misinformation and social influences relating to AAS use. Moreover, the lack of real and authentic information about the adverse health effects of AAS may contribute to the development of positive attitudes toward AAS use. Therefore, effective prevention strategies emphasize not only the potential consequences of AAS use, but also target the attitude change toward AAS use. Those students who finish their education at a high school level may be one target population for intervention and prevention programs. Further research will be needed regarding the risk factors of AAS use, such as attitudes, level of BMI, and educational level.

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5.3.8 Limitations and future research

Several limitations of the present study should be mentioned. The first limitation was the convenience sample, since the majority of the participants were recruited from various places. Since convenience sampling might have influenced which individuals participated in the study, we do not have any data from those ones who refused the participation in the study. Thus, the differences between those male weightlifters who participated in the study and those who refused it still remain unknown. Second, the current study relied on self-reported data. This may be more relevant for the measure of height and weight. Third, there are some concerns relating to the validity of an internet survey, suggesting that directly addressed questionnaires have higher validity. On the other hand, responses given via internet are more anonymous and allow more honest answers to the questions which are sensitive or embarrassing, such as body image concerns among males. The use of directly addressed questionnaires may be disadvantageous, since participants may choose the socially desirable responses instead of honest responding. Fourth, we conducted our study in a population of male weightlifters, which can be considered as a high risk population of MD; however, it is possible that females and non-weightlifters may also develop the disorder. Thus, the generalization of the study results is limited to male weightlifters. Further studies should investigate MD symptomatology in other populations, such as females, other sports men, or the general population. Another limitation of the study is the lack of clinically diagnosed sample. Thus, the MASS can not be used as a diagnostic tool, although it proved to be a valid and reliable measure for the assessment of MD symptoms among male weightlifters and also can be used as a screening tool for those who are at high risk of MD. The use of interview technique for the identification of a clinically diagnosed sample with MD may contribute to the better understanding of this body image disorder; furthermore it could also facilitate the refinement of the MASS cut-off score. Another limitation of the study is the low sample size in some analyses, which reduced the statistical power. Larger sample size would be needed for the detection of weak associations. Finally, the low internal consistency of the SCOFF questionnaire raises methodological concerns. Other Hungarian studies also found low internal consistencies for the scale (Paksi et al., 2009; Szabó, Túry, & Czeglédi, 2011). The low internal consistency of the SCOFF may be related to that it assesses both AN and BN. However,

the symptoms of these classical eating disorders are inconsistent. Moreover, as most of the eating disorder questionnaires, the SCOFF also has been developed on female samples. Further studies should consider the use of other scales for the assessment of eating disorders in this population of male weightlifters.

Some limitations have to be mentioned relating to the study of AAS use. First, we have to be aware of that data may include some false-positive responses (i.e., some individuals may have responded that they used AAS, however they used only supplements or prohormones) and may also include some false-negative responses (i.e., some individuals did not want to disclose their AAS use). Second, as self-report measures were used in the study, there was no objective measure of AAS use, such as urine test. The lack of information relating to the onset of AAS use, the different types of the AAS that have been used in the same time, and the use of other illicit drugs is again another limitation. Finally, the cross-sectional nature of the study may indicate another limitation since the direction of causal relationships is uncertain.

Future research should replicate our study results relating to the prevalence rate of both MD and AAS use. The exploration of MD symptomatology and AAS use should be extended in other populations. Further investigation of usage patterns of AAS, the risk factors and psychological correlates that are associated with the development of MD and AAS use is still needed. Additionally, it would be also important to reveal the protective factors as well. Longitudinal study design would be also useful to follow the development and course of MD, and to investigate the causal relationships. The better understanding of this body image disorder would contribute to the development of effective prevention and intervention programs. Examination of the usefulness of the proposed tentative cut-off score of the MASS and further refinement of the cut point would be also needed.

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6. CONCLUSIONS

Similar to the worldwide trend of body image research, most studies in Hungary have focused on women. While research evidence indicates that the prevalence of men who are dissatisfied with their bodies is increasing in Western cultures, the rate of body dissatisfaction among men in other cultures still remain uncertain. Previous studies described MD as a culture-bound syndrome that is strongly related to the Western body ideals. Our study pointed out the existence of MD symptomatology and subclinical levels of this male body image disorder among Hungarian male weightlifters. Moreover, we found a prevalence rate of 18% among male weightlifters who were at high risk for MD. A further 52% was at low risk for MD, who displayed some symptoms of the disorder. However, it would be important to replicate and extend the current study to confirm our results.

Prior and after to the publication of Túry et al. (2001), no studies have examined MD in a Hungarian male weightlifter sample. Thus, the importance of this study is that it focuses solely on a weightlifting sample, which is considered to have a greater risk for developing MD symptomatology due to the nature of the activity. Since many studies emphasized the importance of cross-cultural examination of MD, the present study is of a great value, since this is the first extensive study of MD in Hungarian male weightlifter population. The study was also able to point out the dramatic changes in trends in male body image concerns and body size ideals in a ten-year perspective. Because of the rapid changes and the comorbid conditions that are associated with the increasing body image dissatisfaction among men (e.g., MD, AAS use, exercise dependence, eating disorders) mental health care professionals should be prepared for challenges. The effective intervention strategies of MD should focus not only on the body image disorder itself, but the associated psychological characteristics as well, for instance, low self-esteem, high trait anxiety, and perfectionism.

Though the current study supported some aspects of previous research, there is still a lack of understanding in regards to MD in Central-Eastern Europe. However, our study results

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outline that the current prevalence rate of MD is higher compared to the earlier national and international data reported from 1993-2000 (Pope et al., 1993 ; Pope & Katz, 1994; Túry et al., 2001). Furthermore, the prevalence rate of MD in the present study is similar to subsequent international prevalence data based on the research and diagnostic criteria of MD (Hildenbrandt et al., 2006). Hopefully, the validation of the MASS in Hungary (MASS-HU), which is the first measure of MD symptoms in Hungarian, will stimulate further MD research and will contribute to the cross-cultural studies on MD.
The AAS use in this high risk population is also understudied in Hungary, since only one former study explored the prevalence rate of AAS use among male weightlifters (Túry et al., 2001). More importantly, according to our knowledge the present study is the first Hungarian study that investigated the psychological correlates and risk factors of AAS users.

Besides our results, we would also like to emphasize that weightlifting as a sport is a healthy physical activity *per se* and the pathologization of this kind of sport would be unwarranted. However, some forms of weightlifting activity can be unhealthy. Our study results also highlighted the benefits of weightlifting, since normal weightlifters (without the symptoms of MD) did not display eating disorder related characteristics, had higher level of self-esteem, lower level of anxiety, and less unrealistic body weight goals than those males who were at low or high risk of MD.

The current study represents only initial steps; further research in this field would improve the understanding of the risk factors of MD and AAS use, and would therefore allow the development of intervention and prevention strategies.

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7. SUMMARY

Muscle dysmorphia (MD) is a male body image disorder, characterized by a pathological preoccupation with the overall muscularity and an intense drive to gain muscle mass. The study examined MD, related psychological correlates, and AAS use in Hungarian male weightlifters. As a first step we aimed to investigate the potential usability of the Muscle Appearance Satisfaction Scale (MASS), a measure of MD symptoms, among Hungarian male weightlifters (n = 60) and university students (n = 60), since no validated instrument for measuring MD symptomatology was available in Hungary. The results suggested that the Hungarian version of the MASS (MASS-HU) is a suitable measure in Hungarian-speaking population; however, further examination was required for the psychometric evaluation of the instrument. Therefore, as a second step we focused on the examination of the psychometric properties of the MASS-HU and also aimed to investigate its relationship with self-esteem and exercise-related variables. Two independent samples of male weightlifters (ns = 289 and 43), and a sample of undergraduates (n = 240) were recruited for this purpose. Exploratory factor analysis supported the original five-factor structure of the MASS only in the weightlifter sample. The MASS-HU had excellent scale score reliability and good test-retest reliability. The construct validity of the MASS-HU suggested an inverse relationship between self-esteem and MD. The MASS-HU was found to be a useful measure for the assessment of MD among male weightlifters. As a third step we aimed to reveal the prevalence rate of MD among male weightlifters (n = 304), as well as to explore the psychological correlates of the disorder. Furthermore, we also targeted to define a tentative cut point of the MASS. The last purpose was to determine the prevalence rate of AAS use among male weightlifters and to examine the characteristics and risk factors associated with AAS use. The results of this study revealed 18.0% prevalence rate of MD among Hungarian male weightlifters. A tentative cut-off score of the MASS was also determined. A score of 62 as an appropriate cut-off point for the MASS was proposed to distinguish between MD and non-MD cases among male weightlifters. Results also indicated that MD was associated with younger age, higher BMI, elevated levels of eating disorder related psychopathological characteristics and trait anxiety, and with lower level of self-esteem. Moreover, higher prevalence rate of

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both current and lifetime AAS use was found in MD group. The examination of the AAS use revealed that the lifetime prevalence of AAS use in our study sample of Hungarian male weightlifters was 27.6%. Current AAS use was associated with higher BMI, elevated levels of MD symptoms, exercise dependence, higher level of interpersonal distrust, and lower level of self-efficacy. The prevalence rate of exercise dependence was higher in lifetime steroid users compared to steroid non-users. The positive attitude and the willingness to try AAS and other substances to increase muscle mass, higher BMI, and low educational level emerged as significant predictors of lifetime AAS use. Our findings demonstrated that MD symptomatology and its subclinical forms may be prevalent among Hungarian male weightlifters. The study was also able to explore the psychological correlates of MD and AAS use that contribute to the better understanding of these problems and eventually to the development of effective prevention and intervention programs.

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8. ÖSSZEFOGLALÁS

Az izomdiszmorfia vizsgálata fokozott kockázatú hazai populációkon

Az izomdiszmorfia (ID) speciális férfi testképzavar, melyet az izomzattal való túlzott foglalatosság és az izomtömeg növelésének intenzív vágya jellemez. A tanulmány az ID-t, annak pszichológiai korrelátumait és az anabolikus-androgén szteroid használatot vizsgálta. Mivel Magyarországon jelenleg nem áll rendelkezésre olyan mérőeszköz, mely az ID tüneteit és súlyosságát mérné fel, ezért első lépésként az Izomzattal Való Elégedettség Skála (Muscle Appearance Satisfaction Scale; MASS) magyar nyelvű változatának használhatóságát vizsgáltuk súlyzós edzést végző férfiak (n=60) és egyetemisták (n=60) körében. Az eredmények alapján a MASS magyar nyelvű változata (MASS-HU) alkalmas mérőeszköznek bizonyult magyar nyelvű populáció körében, a kérdőív azonban további pszichometriai vizsgálatokat igényelt. Ennek alapján második lépésként a MASS-HU pszichometriai vizsgálatát, illetve a mérőeszköz önértékeléssel és testedzéshez kötődő változókkal való kapcsolatának vizsgálatát tűztük ki célul. A vizsgálatban két független, súlyzós testedzést folytató férfi minta (n=289 és 43) és egy egyetemistákból álló férfi minta (n=240) vett rész. Az exploratív faktoranalízis eredménye alapján a MASS eredeti ötfaktoros szerkezete alátámasztást nyert a súlyzós testedzést folytató férfi mintán. A mérőeszköz belső megbízhatósága kiválónak, teszt-reteszt reliabilitása pedig jónak bizonyult. A MASS-HU konstruktum validitása fordított irányú kapcsolatot mutatott az önértékelés és az ID között. Összességében a MASS-HU megbízható eszköznek bizonyult az ID tüneteinek felmérésére a súlyzós testedzést folytató férfiak körében. Harmadik lépésként célul tűztük ki az ID prevalenciájának és pszichológiai korrelátumainak feltárását súlyzós testedzést folytató férfiak között (n=304), valamint a MASS kísérleti ponthatárának definiálását. További célként a szteroidhasználat prevalenciájának, jellemzőinek és rizikófaktorainak feltárását határoztuk meg. A vizsgálat 18,0%-os ID prevalenciát tárt fel a súlyzós testedzést folytató férfiak körében. A MASS kísérleti ponthatáraként a 62 pont bizonyult olyan elválasztási ponthatárnak, amely alkalmas lehet az ID esetek kiszűrésére a fenti populációban. Az ID pozitív irányú kapcsolatot mutatott a BMI-vel, az evészavarral kapcsolatos pszichopatológiai jellemzőkkel és a vonásszorongással, illetve negatív irányú kapcsolatot az életkorral és az önértékeléssel. Az ID tüneteit mutató csoportban

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magasabb volt a szteroidhasználat pontprevalenciája és élettartam prevalenciája is. A szteroidhasználat élettartam prevalenciája az egész mintában 27,6% volt. A jelenlegi szteroidhasználat pozitív irányú kapcsolatot mutatott a BMI-vel, az ID tüneteivel, a testedzésfüggőséggel és az interperszonális bizalmatlansággal, illetve negatív irányú kapcsolatot az énhatékonysággal. Továbbá a testedzésfüggőség prevalenciája szignifikánsan magasabb volt a szteroidhasználók körében, mint a szteroidot nem használók között. A szteroidok és más izomtömeg-növelő szerek kipróbálásával kapcsolatos pozitív attitűd és hajlandóság, a magasabb BMI és az alacsonyabb iskolai végzettség szignifikáns előrejelzője volt a szteroidhasználatnak. A vizsgálat eredményei rámutattak arra, hogy az ID és annak szubklinikai formái gyakoriak lehetnek a súlyzós testedzést folytató férfiak körében. A tanulmány továbbá feltárta az ID és a szteroidhasználat pszichológia korrelátumait. Ezek az eredmények hozzájárulhatnak a problémakör mélyebb megértéséhez, és a hatékony prevenciós és intervenciós programok kidolgozásához.

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APPENDIX

A KUTATÁSBAN FELHASZNÁLT KÉRDŐÍVEK

Izomzattal Való Elégedettség Skála (Muscle Appearance Satisfaction Scale; MASS-HU)

Kérem, válaszoljon a következő állításokra aszerint, hogy azok mennyire vonatkoztak önre az elmúlt négy hét során! Nincsenek jó vagy rossz válaszok.

1 = határozottan nem értek vele egyet
2 = nagyrészt nem értek vele egyet
3 = közömbös/nem tudom
4 = nagyrészt egyetértek vele
5 = határozottan egyetértek vele

1. Amikor a tükörben az izmaimat nézem, gyakran elégedettséget érzek izmaim jelenlegi méretével kapcsolatban.
2. Ha a napirendem arra kényszerít, hogy egy nap kihagyjam a súlyemelést, nagyon nyugtalannak érzem magam.
3. Gyakran kérdezgetem a barátaimat és/vagy rokonaimat, hogy nagynak nézek-e ki.
4. Elégedett vagyok az izmaim méretével.
5. Gyakran költök izomnövelő kiegészítőkre.
6. Az izomtömeg növelése céljából helyesnek tartom a szteroidhasználatot.
7. Gyakran úgy érzem, mintha a súlyzózás rabja lennék.
8. Ha az edzésem rosszul sikerül, az valószínűleg negatív hatást gyakorol a napom hátralevő részére.
9. Bármit kipróbálnék, hogy növeljem az izmaimat.
10. Gyakran megtartom az edzést még akkor is, ha az izmaim vagy az ízületeim fájnak a korábbi edzésektől.
11. Gyakran sok időt töltök azzal, hogy az izmaimat nézegetem a tükörben.
12. Több időt töltök edzéssel a teremben, mint a legtöbben, akik edzenek.
13. Annak érdekében, hogy izmos legyen valaki, képesnek kell lennie rá, hogy sok fájdalmat figyelmen kívül hagyjon.
14. Elégedett vagyok az izmaim feszességével/formájával.
15. Az önértékelésem leginkább arra összpontosul, hogyan néznek ki az izmaim.
16. Gyakran nem veszek tudomást sok fizikai fájdalomról, amikor súlyt emelek annak érdekében, hogy izmosabb legyek.
17. Muszáj nagyobb izmokra szert tennem, bármire legyen is szükségem hozzá.
18. Gyakran keresek másoktól megerősítést, hogy az izmaim elég nagyok.
19. Gyakran nehezemre esik ellenállni annak, hogy az izmaim nagyságát ellenőrizgessem.

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Evészavar Kérdőív (Eating Disorder Inventory, EDI)

Ez a kérdőív különböző véleményeket, érzéseket és viselkedéseket mér. A tételek némelyike ételekkel és evéssel kapcsolatos. Más tételek az Ön saját magával kapcsolatos érzéseire vonatkoznak. Nincs jó vagy rossz válasz, próbáljon meg tehát őszintén válaszolni.

1 = mindig
2 = rendszerint
3 = gyakran
4 = néha
5 = ritkán
6 = soha

1. Édességeket és szénhidráttartalmú ételeket anélkül eszem, hogy idegességet éreznék.
2. Azt hiszem, a gyomrom túl nagy.
3. Jó lenne, ha vissza tudnék térni a gyermekkor biztonságához.
4. Eszem, ha nyugtalan vagyok.
5. Teletömöm magam étellel.
6. Szeretnék fiatalabb lenni.
7. Diétázásra gondolok.
8. Megrémülök, ha érzelmeim túl erősek.
9. Úgy gondolom, combjaim túl vastagok.
10. Hasznavehetetlen embernek érzem magam.
11. Rendkívül bűnösnek érzem magma túlevés után.
12. Azt hiszem, a gyomrom éppen jó méretű.
13. Csak a kiemelkedő teljesítmény elég jó, megfelelő a családomban.
14. A legboldogabb időszak az életben a gyermekkor.
15. Ki tudom fejezni érzelmeimet.
17. Megbízom másokban.
18. Egyedül érzem magam a világban.
19. Elégedett vagyok az alakommal.
20. Általában úgy érzem, hogy a dolgokat ellenőrzés alatt tartom életemben.
21. Zavarba ejt, hogy nem tudom, milyen érzelmet érzek.
22. Inkább felnőtt lennék, mint gyermek.
23. Könnyen kapcsolatba tudok kerülni másokkal.
24. Szeretném, ha valaki más lennék.
25. Eltúlzom vagy felnagyítom a testsúly fontosságát.
26. Világosan meg tudom határozni, milyen érzelmet érzek.
27. Elégedetlen vagyok magammal.
28. Voltak falási rohamaim, amikor úgy éreztem, hogy nem tudom abbahagyni az evést.
29. Gyermekként nagyon erősen próbáltam szüleimnek vagy tanáraimnak.
30. Vannak szoros kapcsolataim.
31. Tetszik a fenekem formája.
32. Nagyon foglalkoztat a vágy, hogy soványabb legyek.
33. Nem tudom, mi zajlik bennem.
34. Nehezemre esik, hogy kimutassam érzelmeimet másoknak.
35. A felnőttkor elvárásai túl nagyok.
36. Gyűlölöm, ha különböző dolgokban nem a legjobb vagyok.

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37. Biztonságot érzek saját magammal kapcsolatban.
38. Falásrohamokra (túlevésekre) gondolok.
39. Boldog vagyok, hogy már nem vagyok gyermek.
40. Nem tudom pontosan, hogy éhes vagyok-e vagy sem.
41. Rossz véleményem van magamról.
42. Úgy érzem, meg tudok felelni a velem.
43. Szüleim kiemelkedőt vártak tőlem.
44. Aggódom, hogy érzéseim fölött elveszítem az uralmat.
45. Úgy gondolom, hogy a csípőm túl széles.
46. Mások előtt mérsékelten eszem, de teletömöm magam, ha elmennek.
47. Normális étkezés után is felfúvódottnak érzem magam.
48. Úgy érzem, az emberek gyerekkorukban a legboldogabbak.
49. Ha hízom egy kg-ot, aggódom, hogy folytatódik a hízás.
50. Úgy érzem, értékes személy vagyok.
51. Ha zaklatott vagyok, nem tudom, hogy szomorú, rémült vagy dühös vagyok-e.
52. Úgy érzem, hogy tökéletesen kell csinálnom a dolgokat vagy sehogysem.
53. Azt gondolom, meg kell próbálnom hányni, hogy fogyni tudjak.
54. Az embereket bizonyos távolságra kell tartanom (kényelmetlen számomra, ha valaki túl közel próbál kerülni hozzám).
55. Azt hiszem, combjaim éppen megfelelő méretűek.
56. Belül (érzelmileg) üresnek érzem magam.
57. Tudok személyes gondolatokról, érzésekről beszélni.
58. Az élet legszebb évei azok, amikor az ember felnőtté válik.
59. Úgy gondolom, a fenekem túl nagy.
60. Vannak érzelmeim, melyeket nem tudok pontosan meghatározni.
61. Titokban eszem vagy iszom.
62. Azt hiszem, csípőm éppen jó méretű.
63. Igen magas céljaim vannak.
64. Ha zaklatott vagyok, aggódom, hogy enni kezdek.

SCOFF kérdőív

Az alábbi kérdések az étellel való viszonnyal illetve a testtel kapcsolatosak. Kérjük jelöle X-szel a megfelelő választ!

	igen	**nem**
Szokott hányni, mert kellemetlenül telinek érzi magát?		
Aggódik amiatt, mert elvesztette a kontrollt afölött, hogy mennyit eszik?		
Az utóbbi időben fogyott-e több mint hat kg-ot háromhónapos időszak alatt?		
Kövérnek hiszi magát, míg mások azt mondják, hogy túl sovány?		
Mondaná azt magáról, hogy az étel uralja az életét?		

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Testi Attitűdök Tesztje (Body Attitudes Test)

A következő állítások a testtel és a testtel kapcsolatos érzésekre vonatkoznak. Kérjük, az alábbi állítások mindegyikénél jelölje, hogy az milyen mértékben igaz Önre!

1 = mindig
2 = rendszerint
3 = gyakran
4 = néha
5 = ritkán
6 = soha

1. Ha összehasonlítom a saját testemet a kortársaiméval, elégedetlen vagyok vele.
2. A testem érzéketlen tárgynak tűnik.
3. A csípőm túl szélesnek tűnik számomra.
4. Jól érzem magam a bőrömben.
5. Nagyon vágyom arra, hogy vékonyabb legyek
6. Azt gondolom, hogy a melleim túl nagyok.
7. Hajlamos vagyok elrejteni a testemet (pl. bő ruhákat hordok).
8. Ha megnézem magam a tükörben, elégedetlen vagyok a testemmel.
9. Könnyű számomra ellazítani a testemet.
10. Azt gondolom, túl kövér vagyok.
11. Tehernek érzem a testemet.
12. Úgy tűnik nekem, mintha a testem nem is az enyém volna.
13. Úgy érzem, mintha egyes testrészeim dagadtak lennének.
14. A testem szorongást jelent számomra.
15. A testi megjelenésem nagyon fontos számomra.
16. Olyan nagy a hasam, mintha terhes lennék.
17. Feszültséget érzek a testemben.
18. Irigylem mások testi megjelenését.
19. Olyan dolgok történnek a testemben, melyek megijesztenek.
20. Figyelem, hogy milyennek látszom a tükörben.

Testedzés Addikció Kérdőív (Exercise Addiction Inventory)

A következő kérdések a sportolásról, testmozgásról, edzésről szólnak. Kérjük, az alábbi állítások mindegyikénél jelölje, hogy az milyen mértékben igaz Önre!

1 = Nagyon nem értek egyet
2 = Inkább nem értek egyet
3 = Egyet is értek, meg nem is
4 = Inkább egyetértek
5 = Nagyon egyetértek

1. A testedzés a legfontosabb dolog az életemben.
2. Konfliktusok adódnak köztem és a családom és/vagy partnerem között amiatt, hogy mennyit edzek.

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3. A testedzést arra használom, hogy a hangulatomon változtassak (pl. hogy kellemesebben érezzem magam, vagy hogy ne kelljen a problémáimmal foglalkoznom).
4. Az elmúlt időszak során növeltem a napi edzésmennyiségemet.
5. Ha ki kell hagynom egy edzést, rosszkedvű és ideges leszek.
6. Ha csökkentem a szokásos edzésmennyiségemet, akkor, amikor újra elkezdem az edzést, addig folytatom, amíg az eredeti mennyiséget el nem érem.

Állapot és Vonásszorongás Kérdőív – Vonásszorongás alskála (Strait-Trait Anxiety Inventory)

Néhány olyan megállapítást olvashat az alábbiakban, amelyekkel az emberek önmagukat szokták jellemezni. Karikázza be a számok közül a megfelelőt attól függően, hogy ÁLTALÁBAN HOGYAN ÉRZI MAGÁT. Nincsenek helyes válaszok. Ne gondolkozzon túl sokat, hanem azt a választ jelölje meg, amely általában jellemző Önre.

1 = egyáltalán nem
2 = valamennyire
3 = eléggé
4 = nagyon

Általában…

1. Jól érzem magam.
2. Gyorsan elfáradok.
3. A sírás ellen küszködnöm kell.
4. A szerencse engem elkerül.
5. Sokszor hátrányos helyzetbe kerülök, mert nem tudom elég gyorsan elhatározni magam.
6. Kipihentnek érzem magam.
7. Nyugodt, megfontolt, tettrekész vagyok.
8. Úgy érzem, annyi megoldatlan problémám van,hogy nem tudok úrrá lenni rajtuk.
9. A semmiségeket is túlzottan a szívemre veszem.
10. Boldog vagyok.
11. Hajlamos vagyok túlságosan komolyan venni a dolgokat.
12. Kevés az önbizalmam.
13. Biztonságban érzem magam.
14. A kritikus helyzeteket szívesen elkerülöm.
15. Csüggedtnek érzem magam
16. Elégedett vagyok.
17. Lényegtelen dolgokat is sokáig foglalkoztatnak, és nem hagynak nyugodni.
18. A csalódások annyira megviselnek, hogy nem tudom kiverni őket a fejemből.
19. Kiegyensúlyozott vagyok.
20. Feszült lelkiállapotba jutok és izgatott leszek, ha az utóbbi időnek gondjai-bajaira gondolok.

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Rosenberg Önértékelés Skála (Rosenberg Self-Esteem Scale)

Az alábbiakban néhány állítást sorolunk fel azzal kapcsolatban, amit általában Önmagával kapcsolatban érezhet. Soronként egy választ jelöljön meg attól függően, hogy mennyire ért egyet az adott állítással.

1 = egyáltalán nem értek egyet
2 = nem értek egyet
3 = egyetértek
4 = teljesen egyetértek

1. Úgy érzem, értékes ember vagyok, legalábbis másokhoz képest.
2. Úgy érzem, sok jó tulajdonságom van.
3. Mindent egybevetve, hajlamos vagyok arra, hogy egy csődtömegnek tartsam magam.
4. Képes vagyok olyan jól csinálni a dolgokat, mint mások.
5. Úgy érzem, nem sok mindenre lehetek büszke.
6. Jó véleménnyel vagyok magamról.
7. Összességében elégedett vagyok magammal.
8. Bárcsak jobban tudnám magam tisztelni.
9. Időnként értéktelennek érzem magam.
10. Néha azt gondolom, hogy semmiben sem vagyok jó.

Általános Énhatékonyság Skála (General Self-Efficacy Scale)

Mennyire jellemzőek Önre az alábbi dolgok? Kérjük, soronként egy választ jelöljön meg, attól függően, hogy mennyire ért egyet az adott állítással!

1 = egyáltalán nem jellemző
2 = alig jellemző
3 = jellemző
4 = teljesen jellemző

1. Mindig sikerül megoldanom a nehéz problémákat, ha nagyon akarom.
2. Ha valaki szembeszegül velem, megtalálom a módját, hogy elérjem, amit szeretnék.
3. Nem esik nehezemre, hogy kitartsak szándékaim mellett és elérjem a céljaimat.
4. Ötletességemnek köszönhetően tudom, miként kezeljem a váratlan helyzeteket.
5. Biztos vagyok benne, hogy jól tudok boldogulni a váratlan helyzetekben.
6. Megfelelő erőfeszítéssel majdnem minden problémára találok megoldást.
7. Meg tudom őrizni a nyugalmamat a nehézségekkel szemben, mert támaszkodni tudok megoldóképességemre.
8. Ha szembesülök egy problémával, általában több ötletem támad a megoldásra.
9. Ha sarokba szorítanak, rendszerint kitalálom, mitévő legyek.
10. Bármi történik, általában kezelni tudom a helyzeteket.